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# Electrical World

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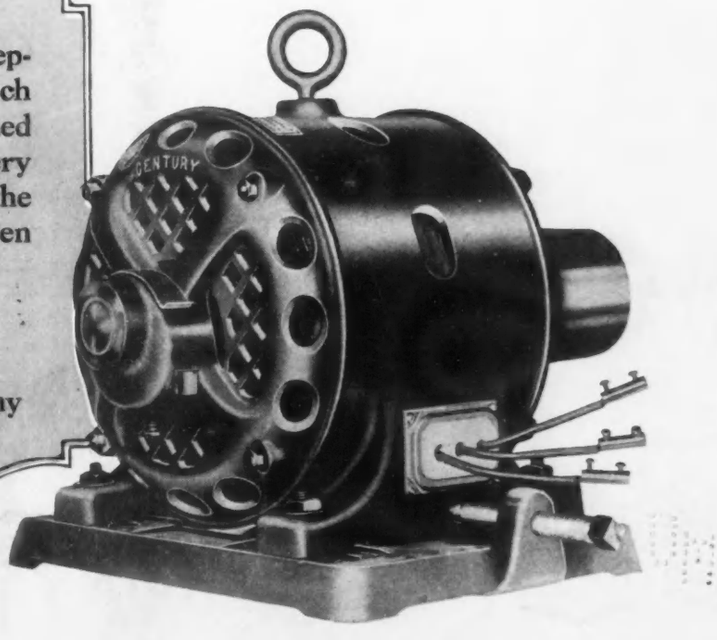

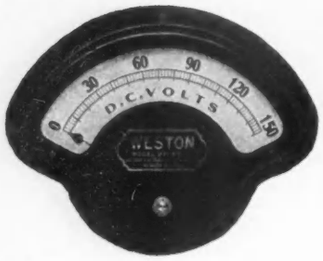

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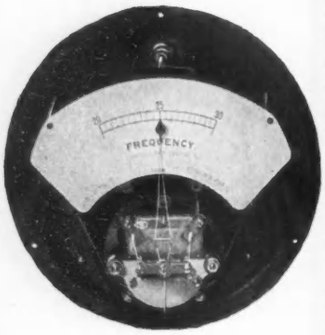


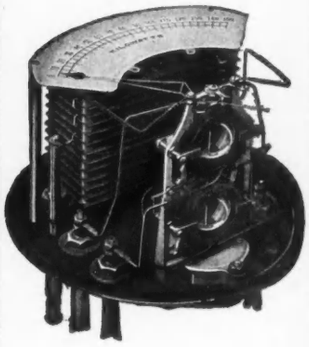

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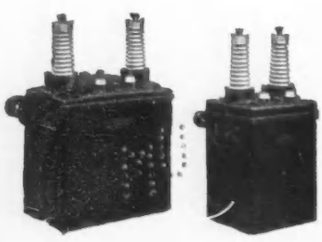

# Electrical World

*The consolidation of Electrical World, Electrical Engineer and American Electrician*

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# *"More Business—Better Business"*

INSPIRATION and good working courage will flow to the entire electrical industry from the nation-wide "More business—better business" campaign that is now being organized by the National Electric Light Association. The central-station companies and the manufacturers are back of the movement. The jobbers will co-operate. The contractors and dealers will tie into it. The Society for Electrical Development has offered its full staff and resources. The entire industry will be united in the creative drive, and a great practical achievement will result.

For the opportunity which we confront surpasses all powers of description. Words and figures do not picture it. A million and a quarter new residence customers will be connected to the central-station circuits this year. Nearly seven million others are ready to buy additional equipment. Factory, store and business customers present a market in proportion. The nation stands waiting with its needs and with its mind about made up to satisfy them now at last. And business—more and better business—the return of those "good times" that we enjoy in periods of general prosperity—will come to us as soon as we are ready to do two essential things:

FIRST, we must recognize that it is every man's own job right where he is to make his business better for himself. Nobody rubs a magic lamp and conjures up prosperity. The circumstances that produce it do not happen of themselves. Good times are not the cause of better business but the natural effect. The better work of men and women is the cause. And good times come when men and women make them, not one day before. Therefore we have the making of the better business in ourselves, and when we set to work to *"do it now,"* then will it come.

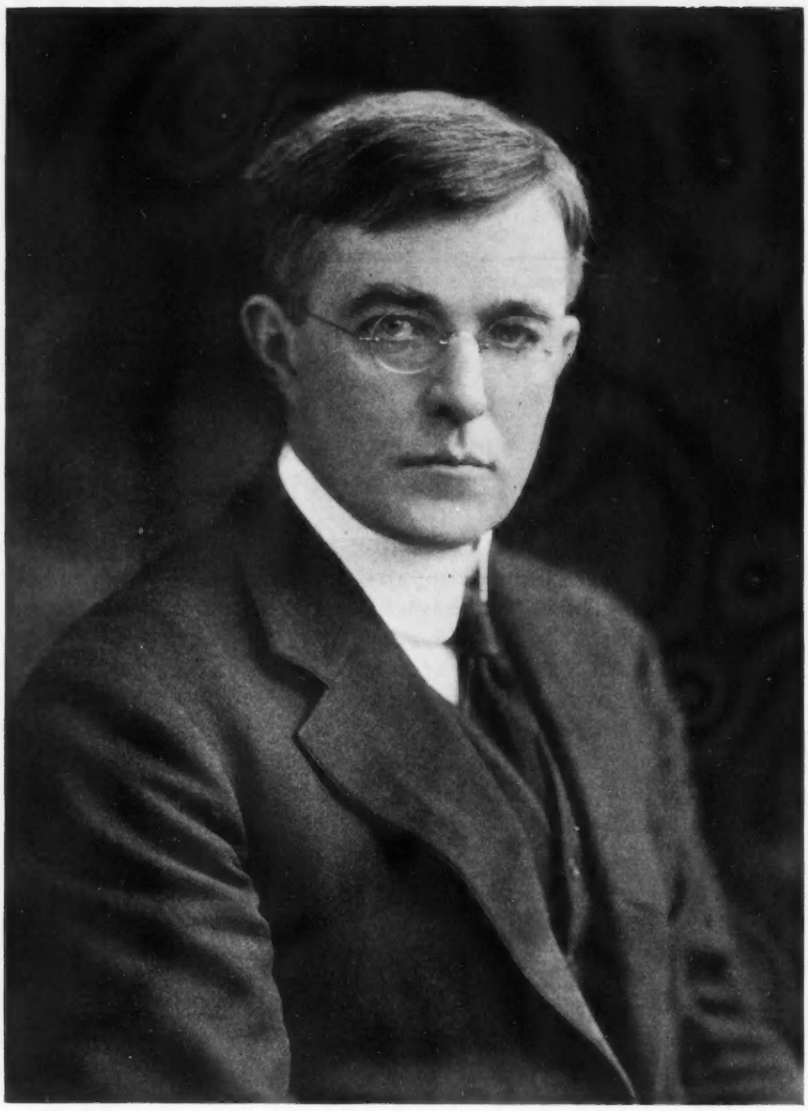
Second, we must have bigger vision in our work. The man who has been wiring one home must see that nine more houses can be wired at the same time if he will do a bigger job. The man who has been selling ten flatirons must realize that he can as quickly sell one hundred if he will but increase his selling influence to scale, and he who in the past has been content to send five salesmen out must send out ten with five times the support and preparation to produce ten times the good result.

"MORE business—better business." What will it all be fashioned of? Ambition, enterprise, energy and effort—these are the tools to build it with. A bigger vision will do a bigger job. A stronger and more confident determination to get it done will speed the work. A more lasting courage will achieve the larger purposes. Clearer, more resourceful planning will carry through to greater measures of success.

This campaign will be made great by the individual men of the electrical industry—no other way. When we refuse to wait another day and with a bigger vision set ourselves to do this job, then, and then only, will more and better business come.

# Irving Langmuir

*A scientist of unusual ability, inventor of the gas-filled lamp and pioneer investigator in the new field of electron engineering.*



ELECTRICAL engineering is on the threshold of a new era which bids fair to be of greater importance to the service of mankind than anything that has gone before. To this new development is now being given the name of electron engineering. Telephony, radio work, power transmission and illumination have all been greatly advanced as a result of these discoveries about the behavior of the smallest division of matter—the electron. Much of the progress that has been made in electron engineering can be attributed to the researches in the field of physical chemistry by Dr. Irving Langmuir, research physicist with the General Electric Company at Schenectady.

To the electrical industry at large Dr. Langmuir is probably best known as the inventor of the gas-filled incandescent tungsten lamp. It is a curious fact that the early experimenters who were searching for an incandescent lamp started with gas-filled bulbs, but because they did not know the laws governing energy dissipation from small wires they concluded that only exhausted bulbs could be used. Dr. Langmuir has also been engaged in making investigations on electric heating devices and on laws of heat transmission in electrical machinery.

Great as has been the practical value of his invention of the gas-filled lamp—so great that half the aggregate candle-power of tne lamps sold today is in such lamps—it is probable that still more important results will come from his pioneer work in electronics. Other leading physicists had worked in this field, but their results were seemingly inconsistent, and conduction in vacuo was a subject full of doubt and apparent contradictions. Langmuir by his discovery of "space charge" was able to clear up the doubts, reconcile the contradictions and round out the complete theory of pure electron discharge. The completion of this theory at once made possible the development of the pliotron, kenotron and other high-vacuum tubes, which are already revolutionizing the radio art and are rapidly approaching the point of utilization in the field of high-power engineering.

Dr. Langmuir's investigations of high vacua have made him the leading authority on chemical reactions at very low pressures, but his greatest contribution to theoretical science has been the development of his theory of the arrangement of electrons in atomic and molecular structure. This theory is comprised in what are known as the Langmuir postulates.

Dr. Langmuir was born in Brooklyn, N. Y., Jan. 31, 1881. He was graduated from Columbia University in 1903 with the degree of metallurgical engineer. Three years were then spent in post-graduate work in Germany at the University of Göttingen under Professor Nernst, inventor of the Nernst lamp. Upon his return to America in 1906 he became an instructor in chemistry at the Stevens Institute of Technology. Three years later he entered the research laboratory of the General Electric Company, where he is at present assistant director.

Possessed of an extraordinary analytical mind, he has in addition an intuitive ability to go to the heart of any problem even though it prove foreign to the field of his personal activities. His ability to discard non-essentials has been one of his greatest assets.

Dr. Langmuir is a member of a number of scientific organizations and has been the recipient of distinguished honors in the field of chemistry, physics and engineering. Among the awards made to him have been the Nichols medal, given by the American Chemical Society and awarded to him in 1915 and 1920; the Hughes medal, awarded by the Royal Society of London, 1918; the Rumford medal, by the American Academy of Arts and Sciences, 1920; the Farraday medal, by the Farraday Society, London, 1921, and a medal of honor awarded at the Panama Pacific International Exposition at San Francisco, 1915. Dr. Langmuir also received an honorary degree of doctor of laws from the University of Edinburgh in September of last year.

# Editorial Comment

Electrical World, January 21, 1922

Volume 79 Number 3

### The Never-Ending Coal Menace

THE wage agreements in both the anthracite and bituminous coal fields terminate on April first this year, and with their expiration comes the possibility of a coal strike of large proportions. Whether or not such a crisis will be brought about none but labor union leaders can tell. Encouraged by the unrest among the locomotive firemen, the miners' unions may seek to win the sympathy of the latter, hoping thereby to make their fight doubly effective in curtailing coal production and in hampering the commerce and industry of the country. Will these costly disputes between coal producer and miner ever cease? The question of coal production and distribution seems to be constantly up for discussion. Settlement and stability are as remote as ever, and as for the general public, apparently no thought is ever given it—certainly little consideration. If the miners are not starting a rumpus, the railroads are agitating something, and thus it goes. Meanwhile the users of coal must get on as best they can. In the public utility field, particularly, where service must be maintained at all hazards, the safeguarding of the coal supply becomes a trying problem under such circumstances. Nevertheless, utility managers must not cease their vigils, and even though threatening strikes do not materialize, they cannot afford to take chances. It would be an act of prudence, therefore, to insure against possible interruption of service by laying in ample reserves. Nor is it too soon to begin.

### The Lockwood Committee and Incandescent Lamps

THE Lockwood legislative committee of New York, formed for the purpose of investigating the housing situation, chose to go far afield and delve into the manufacture of incandescent electric lamps. Not that the price of lamps has any effect whatsoever on the cost of building or the price of rent, but because one-sided testimony makes fine material for newspaper headlines. Startling accusations are made against the General Electric Company, all of which, of course, have still to be proved, but none of which need be feared. If to make the best incandescent lamp in the world is a crime, then we ought to encourage such criminals. Having invented a filament of admitted superiority, the General Electric Company rightly enjoys a patent monopoly on a certain kind of tungsten lamp. Naturally, plenty of other manufacturers would like to make it, just as plenty of automobile manufacturers would like to build Ford cars. If the General Electric Company chooses to license other manufacturers to make tungsten lamps, that is entirely its own affair and no one else's, and the courts will sustain it. Its system of lamp distribution, whatever its demerits, has the advantages of efficiency and economy and assures to the public at all times an excellent product at a reasonable price.

Considering the efficiency of the "Mazda" lamp and the money spent in its development, the cost is remarkably low—a result due to mass production. Its manufacture entails 112 operations of precision, and yet any one can buy the lamp in 25-watt or 40-watt sizes for 40 cents, whereas a straight oil-lamp chimney, involving nothing in its manufacture but the glass blower's art, sells for 27 cents. Moreover, glass lamp chimneys add little or nothing to the efficiency of the oil lamp, whereas the "Mazda" lamp is three times as efficient as the carbon lamp. Were carbon lamps still in vogue, the electric light bill of the country would have been $1,500,000,000 last year instead of $500,000,000. The best testimony to the worth of the "Mazda" lamp is shown by the rapidity with which it has displaced the carbon-filament lamp and its almost universal use at the present time. American law and tradition fortunately have never withheld proper credit and recompense from those to whom it is rightfully due and are not likely to do so now, the Lockwood committee and its counsel notwithstanding.

### Lighting Code Deserves General Adoption

THE final adoption of the Illuminating Engineering Society's industrial code as the "American Standard" puts a new face upon the code situation throughout the country. One cannot entirely wonder that some states were slightly hesitant in taking up definite lighting codes while, in a sense, it was evident that the subject was more or less in a state of flux and that those best qualified to standardize practice had not yet finished their labors. At the present moment there is no such excuse left for inaction. During the past three or four years the matter has been pretty thoroughly thrashed over, and in the final adoption of the code by the Engineering Standards Committee a somewhat definite stand had been taken in details.

We could wish that the mandatory parts of the code had perhaps gone a little further, so as to furnish not only a sound basis for legislation but a model law worked out somewhat thoroughly. This, however, may well come later after further experience has been gained through the adoption of codes in various states. The general situation seems to be that there is comparatively little opposition on the part of employers who have either knowledge of the subject or desire to learn.

Those who oppose the provisions of existing codes are almost entirely connected with a few industries in which evil conditions in almost every respect have been handed down from bygone generations and whose managers are too blind either to see the requirements of the situation or, seeing them, to take action involving expense—expense which should have been incurred a generation ago instead of waiting for the strong arm of the law to enforce a change.

The main trouble in carrying through codes, we think,

will be found in dealing with these comparatively few old industries and with a small but noxious group of mean and petty sweatshops that cause trouble whenever attempts to better working conditions are made. The principal practical difficulties in enforcing the codes through the actual work of the inspectors lie in the assignment of each operation or group of operations to its proper place in the table of intensities.

One of the commonest attempts to nullify and evade the provisions of the code is to demand insistently that the exact foot-candles for each and every operation should be set forth and specified by experiment, which might take anywhere from one to fifty years and during the course of which new operations and new methods of performing them would be perpetually brought up. Another specious scheme to avoid furnishing any perceptible quantity of light is based on the theory that in operating machines which are semi-automatic or fully automatic no lighting is required beyond the merest amelioration of absolute darkness. It is, of course, quite true that in certain operations a worker only uses his eyes occasionally, but in nine cases out of ten when he needs his eyes at all he needs them very badly. For instance, a typesetter gets so deft that he assembles the type with scarcely a glance at his case, his fingers instinctively picking up the right letter. A half of a foot-candle might answer his purpose if he did not have to look at his work. But when he does have to read the face of the type the conditions are such that he needs the very best light attainable, and needs it at once. The argument is merely an effort to evade responsibility and will, we think, carry no weight whatever with intelligent inspectors.

The inspector's duty is not easy, however, because he has to pass upon the class in which a given operation should fall. But he can be trained to do the work and do it fairly and well, relying incidentally on measurement, chiefly on the application of common "horse" sense to the perception of the workman's needs as interpreted by one who stands by his elbow and attempts to put himself in his place. We hope that this coming year is going to inaugurate a new era in the formulation and application of regulations for industrial lighting.

## The Invested Interest Will Not Be Forgotten

NOT many years ago a wave of enthusiasm for municipal ownership of public utilities was sweeping through the country. That wave has died away now, and there are two things that are responsible. One is mismanagement of the railroads under public operation. The other is customer ownership of securities.

The difficulties into which we came while the government ran the roads convinced the people everywhere that the "M. O." idea is not workable. The experiences of the increasing number of people who have become partners with the public service companies through stock ownership have demonstrated that the most sensible and satisfying way to regulate and operate is through personal participation in the enterprise. And so this new era of prosperity and hope has come to the utilities. The fear of municipal ownership has been laid away. For the lesson of the mismanagement of the railroads will be forgotten, but the invested interest of the customer in the utility will not be forgotten. Blessed be the name of "customer ownership."

## Burning Tests to Determine Fuel Quality

THE best test of the value of coal for producing steam is that made under the boiler when it is operating under service conditions. The amount of steam produced and its cost is the final answer. Oftentimes an analysis will indicate that a given coal is possessed of desirable qualities when experience with it will show that it is much less desirable than coal that appears of far poorer quality. This may be due to the character of the grate or stoker equipment not being suited to the coal, or it may be due to characteristics of the coal itself, such as the tendency to form clinkers to an extent that increases boiler-operating troubles and makes handling of ash a serious and expensive problem. Capacity of boilers may be cut down by the same cause.

The analysis is a factor in the judging of coal that is needed, but its largest usefulness probably lies in the day-by-day checking of the quality of a fuel that has been previously determined by actual tests to have the proper burning qualities to suit the plant in which it is to be used.

## Causes of Labor Turnover Need Study

THERE has been considerable discussion in the last few years of the matter of labor turnover in manufacturing plants, public utilities and all places where skilled or unskilled labor is used. Many definitions of labor turnover have been proposed and many means of calculating it have been devised. Those plants where the labor turnover is small compared with the average pride themselves on their adequate treatment of their men; other plants where the turnover is high regret the condition and generally blame it on the shiftlessness of the employed.

Labor turnover during the war and in the period immediately following was enormous and even now in dull times we find that it is high in many places. The evil should be corrected. The actual economic waste is very large. Men trained in one particular plant must learn new methods in another plant, even if they do approximately the same work. Furthermore, they do not reach their former efficiency at once. Often leaving one job means taking another one with very different requirements where time is required to gain proper skill. Bookkeeping and record keeping, complicated as they are because of piece work and bonus systems, are immensely increased by labor turnover. Not only is the general efficiency of plants decreased, but the men who make many changes lose time, lose pay and lose opportunity for betterment and advancement. Both capital and labor are losers.

It is evident that the logical way of attacking the problem is to make use of the data available. These data may in some places be adequate to suggest remedies. In most places accurate determination and concise records of the causes for leaving employment must be made over a period of time. When in each plant or in each industry the reasons for men quitting are known definitely it will not be difficult to determine whether improvement of general working conditions, decreasing the monotony of the work, adopting bonus and profit-sharing systems or participation of the workers in the management is the most needed remedy, or in what degree each one will conduce to better conditions. What we need are accurate records and intelligent analysis.

### Should Utilities Repair Their Distribution Transformers?

AS THERE is considerable difference of opinion regarding the advisability of transformer repairs being made by central-station companies, G. E. Decker's article in this issue on "Factory Methods Applied to Transformer Repair Work" is timely and should be of assistance to the industry. It is evident naturally that a decision as to the repairing of distribution transformers should be based entirely on a thorough study of the economics of the proposition, taking in all the features involved. The problem is a large one and many companies have not undertaken it. The outline by Mr. Decker of the method to use is complete. It shows that he has apparently given careful thought to all the considerations involved. He has also shown very completely the results of such a practice in the case of a large company, and though his findings apply to an unusually large number of transformers on one system, his general method can be applied to any system. The thoroughness of the work should be of great assistance in facilitating a similar study in other places, not only for making certain that present repairs are justifiable, but for making a decision regarding the installation of a repair shop where none is in existence.

### More Accurate Knowledge of Industrial Electric Heating Vitally Important

NO SMALL significance appears in the recent announcement of intensive courses in industrial electric heating for central-station power engineers which at this moment are scheduled to have begun under the auspices of the Power Sales Bureau of the N. E. L. A. through the co-operation of leading manufacturers of this class of apparatus. The need of a far better understanding of the development of this branch of the art by these well-trained utility men has been overlooked in the recent past by not a few executives. Progress during the last five years has been so rapid in this field that in a good many cases central-station sales engineers have little more than a bowing acquaintance with the equipment and resources today available for solving problems of intensive heat application electrically. The attractiveness of such loads from the diversity-factor and consumption standpoints is often unrealized, excluding, of course, some applications which are still troublesome. Long-hour demand is another characteristic which warrants the enthusiastic interest of managers of central-station companies in cultivating intelligently this newer and expanding use of electric service.

The courses to be given at the factories of the Westinghouse and General Electric companies are not expected to develop specialists in this field overnight, but in seventeen to nineteen days men of the caliber of the successful central-station power engineer of 1922 can absorb more ideas as to the achievements and resources of electric heating under the intensive instruction of experts of national reputation than can be attained so quickly in any other effective way known to us. The range of the courses, their persistently practical nature and the type of men standing back of the lectures, shop and laboratory work involved are sure to inspire those who complete them to more valuable service.

That the manufacturers are giving these courses with no cost to the students beyond their traveling and hotel expenses and their regular "money from home" speaks extremely well for the spirit of co-operation thus evidenced. As things stand now, too little real knowledge of the fundamentals of industrial electric heating applications exists in central-station circles, and here is an opportunity to invest the time of picked and enthusiastic men for the ultimate reward of intelligent and profitable load building in a field whose future bids fair to rival that of the motor.

### Great Achievements Expected in Electron Engineering

PROGRESS in applications of the electron tube goes on apace, due to the widening knowledge of its properties, to experiment with new forms of tube and to recognition of its adaptability to various practical uses. The importance and value of the tube in recent engineering research were noted in the issue of the ELECTRICAL WORLD for the first of the year. The most striking recent applications have been in its use as amplifier and detector, a culminating example being the simultaneous delivery of President Harding's Armistice Day address to large audiences on both the Atlantic and Pacific Coasts.

Naturally close study of the tube itself has continued, and its characteristics in all its varied forms are becoming more and more definite. The past year has seen several new forms of rectifying tube, new properties of four-electrode tubes, including that of a negative-resistance characteristic, and the introduction of the magnetic field as a control agent. The last-named class of tube is especially interesting, not only because as detector it permits electrical separation of the circuits on the receiving and delivery sides, but specially because as generator and rectifier there is mentioned in connection with it the possibility of greatly extending the range of power handled. Evidently this tube is being closely studied from this standpoint. It has already risen above the watt and embraced the kilowatt as its unit of rating, being used under these circumstances as a high-frequency generator. From the standpoint of engineering it would appear that further progress is to be looked for along the two general lines mentioned, namely, further applications of the tube, especially in its functions as detector and amplifier, and the developments of the tube itself to place it in the power-transforming class, particularly as generator and rectifier. There is every indication that in the last-named capacity particularly important achievements will soon be realized.

These tubes make a powerful appeal to the imagination since all their remarkable properties arise in the very simple expedient of the flexible control, by either electric or magnetic fields, of the motion of free electrons in space. This brings us at once to an intimate acquaintance with a fundamental constituent of all matter, *i.e.*, the electron, and thus very close to the ultimate problem of physical science, the nature of the constitution of matter. One important line of investigation in this field is the study of ionization by collision at higher and higher velocities. It is found that the deeper an electron may be made to penetrate into the mass of an atom, the more varied the effects, as, for example, in the luminous and electromagnetic radiations from a gas, and from these effects it is possible to draw very definite conclusions as to the nature of the structure of the atom of the gas. In order to obtain these high velocities, high voltages are necessary, and the hot-cathode tube provides one of the best methods for controlling electronic omission as regards both volume and velocity under high-voltage gradient.

# 100,000-Volt Lines Through the Streets of Berlin

THE citizens of Berlin do not object to high-voltage lines in the center of their city if the accompanying illustration of a 100,000-volt line through a main thoroughfare is any proof. Neither does Seattle nor Niagara Falls, in both of which a high-voltage line runs across the city, although at somewhat reduced voltages. This practice is not common, but it does not seem that there should be any objection to it anywhere if proper precautions are taken to provide rugged construction. Voltages of this magnitude are no more deadly than 2,300 volts and 4,400 volts, which are accepted city distribution voltages. In some cases the permission to run high-voltage lines through cities would save the electric service companies considerable expense, which must be offset by increased rates where they are obliged to place their step-down stations in the outskirts.

# Factory Methods Applied to Transformer Repair Work

## The Large Number of Transformers Passing Through Repair Shops of the Southern California Edison Company Allows the Use of Factory Methods in Rewinding and Repairing

By G. E. DECKER

*Superintendent of Shops, Southern California Edison Company*

FOR years it has been the practice of the Southern California Edison Company to rewind or repair all of its own transformers of whatever rating and voltage whenever this could be done at a profit over the cost of new transformers. A definite system of testing all transformers and the keeping of accurate records of performance and costs have been the factors which have permitted this work to be placed upon a businesslike basis. Careful study of the best methods of handling such apparatus in the shops has held the cost of repairs to the minimum.

The company maintains a record of each individual transformer from the time of its purchase until it is junked. As soon as a transformer is received from the manufacturer it is sent to the testing department, where all necessary data—such, for instance, as concern the ratio, core loss, heating, resistance and polarity—are determined and the high-voltage and other tests made. This record is used as an acceptance test and is checked against the manufacturer's guarantee. The record then is available for any future change or rewinding that may take place.

Every time a transformer is disconnected from the lines for any reason it is again passed through the testing department for inspection and test to determine its condition, and it is then passed on to the shop department with a small tag attached (Fig. 1) on which notations are made, such as "Rewind" or "Clean and paint." If the transformer has been in service a great many years or is of an old design such as those made before the general use of the present high grade of transformer iron, the core-loss test is again made. Upon coming from the shop it receives a final check and is passed into the general store.

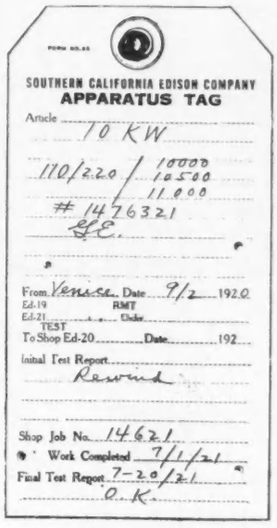

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FIG. 1—TAGS ARE ATTACHED TO EACH PIECE OF APPARATUS PASSING THROUGH DEPARTMENT

It is the standard practice of the Southern California Edison Company to require all work that comes out of the shop to pass the same high-standard A. I. E. E. tests that are required of new apparatus. As the A. I. E. E. voltage test is double voltage plus a thousand volts for the ground test, it is obvious that difficulties with some old makes of transformers, especially those with 6,600-volt primaries, have been experienced. Many of these transformers probably never had any test that compares with the one prescribed by the A.I.E.E. today.

Several 6,600-volt transformers have been found inclosed in cases that were designed for only 2,200 volts, and the clearance between case and terminal board was too small to allow the standard test voltage to be applied. In some instances of this kind the difficulty has been overcome by putting on a special cover with a raised center to give the necessary clearance. In addition, some of these transformer cases were so short that the oil did not cover the terminal board. Then it was found advisable in rewinding to change the primary voltage to 2,200. In rewinding to a lower voltage, however, the new cost of the lower-voltage transformer must be used to predetermine the limiting cost of repairs and allow for the necessary margin between the new cost and the cost of rewinding.

### JUNKING LIMITS FOR TRANSFORMERS

The necessary margin to allow between the new cost f.o.b. the company's warehouse and the total cost of rewinding is based entirely on fixed quantities. Moreover, the advisability of rewinding or junking a transformer is likewise predetermined by a formula that has been worked out in the testing department.

*For Transformers Not Burned Out.*—The watts loss per annum at $0.008 per kilowatt-hour should not exceed the interest at 8 per cent on the cost of a new transformer (less the junk value) plus the average loss on a new transformer at $0.008 per kilowatt-hour. (See Formula A.)

The exciting current is figured the same way except that the energy is figured at $0.0016 per kva. (See Formula B.)

(A)
$$\frac{8{,}760 \times 0.008 \times X}{1{,}000} = 8\% \times C + \frac{8{,}760 \times 0.008 \times W}{1{,}000}$$

(B)
$$\frac{8{,}760 \times 0.0016 \times Y \times (\text{va. rating})}{1{,}000} = 8\% \times C + \frac{8{,}760 \times 0.0016 \times Z \times (\text{va. rating})}{1{,}000}$$

in which:

8,760 = hours per year.
0.008 = dollars cost per kilowatt-hour.
8% = interest charge on investment.
$W$ = watts core loss on average new transformer.
$C$ = average cost of new transformer less its junk value.
$X$ = the maximum core loss in watts that will be allowed.
(va. rating) = the volt-ampere rating of transformer.

0.0016 = dollars cost per kva. for exciting current.
$Y$ = the maximum exciting current in per cent that will be allowed.
$Z$ = exciting current in per cent of an average new transformer.

*Example.*—Given a 10-kw., 6,600-volt transformer, to find $X$ and $Y$.

(A)

$$\frac{8{,}760 \times 0.008 \times X}{1{,}000} = 0.08 \times 154 + \frac{8{,}760 \times 0.008 \times 87}{1{,}000}$$

Therefore $X = 263$.

(B) $$\frac{8{,}760 \times 0.0016 \times Y \times 10{,}000}{1{,}000} = 0.08 \times 154 + \frac{8{,}760 \times 0.0016 \times 0.025 \times 10{,}000}{1{,}000}$$

Therefore $Y = 0.113$, or 11.3 per cent.

*For Transformers Burned Out.*—The above formulas A and B are used except that instead of using the "net cost of a new transformer" the difference between the "net cost of a new transformer" and the "cost of rewinding" is substituted.

In using this table it is necessary to know what the losses were before the transformer was burned out and also that they do not exceed those given for the average new transformer. These are given in the accompanying table.

In order to eliminate the necessity of figuring each individual transformer, tables are made up for the different classes of transformers which will show at a glance whether a transformer should be junked or rewound. Such data for 2,200-volt primary transformers is shown in the table. By referring to this table it will be seen that a 5-kw. transformer which is not burned out has a limit of 134 watts for core loss and 12.9 per cent exciting current; therefore, in testing this transformer, if either one of these factors goes above this limit, the transformer is automatically junked. In case the transformer is burned out, the core watt limit is 68 and the per cent exciting-current limit is 6.3.

Because of the very rapid growth of the Southern California Edison Company, due not only to the absorp-

JUNKING LIMITS FOR ALL MAKES OF OLD TRANSFORMERS

50-cycle, 2,200-volt primary winding

(Showing at a glance the test limits within which a transformer must come to make it economical to rewind it)

| Kva. Rating | Loss of Watts | Per Cent Exciting Current New Transformer | Transformer Cost, New | Junk Value | Net Cost | Rewind Cost | Not Burned Out Limits: Core Loss Watts | Not Burned Out Limits: Per Cent Exciting Current | Burned Out Limits: Core Loss Watts | Burned Out Limits: Per Cent Exciting Current |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 25 | 9.0 | 35.50 | 2.50 | 33 | ... | 63 | 28.0 | Junk | |
| 1.5 | 27 | 8.0 | 43.50 | 3.00 | 40.50 | ... | 74 | 23.4 | 27 | 8.0 |
| 2 | 31 | 7.5 | 50 | 4.00 | 46 | 44 | 84 | 20.6 | 33 | 8.1 |
| 2.5 | 34 | 7.0 | 56 | 5.00 | 51 | 44 | 93 | 18.7 | 42 | 8.6 |
| 3.0 | 38 | 6.5 | 62 | 6 | 56 | 45 | 102 | 17.2 | 51 | 8.6 |
| 4 | 44 | 5.5 | 72 | 8 | 64 | 48 | 117 | 14.7 | 62 | 7.8 |
| 5 | 50 | 4.5 | 83.50 | 10 | 73.50 | 58 | 134 | 12.9 | 68 | 6.3 |
| 7.5 | 66 | 4.5 | 109 | 14 | 95 | 68 | 175 | 11.7 | 97 | 6.6 |
| 10 | 81 | 4.0 | 133 | 18 | 115 | 78 | 213 | 10.6 | 123 | 6.1 |
| 15 | 106 | 4.0 | 177 | 24 | 153 | 88 | 282 | 9.9 | 180 | 6.5 |
| 20 | 135 | 4.0 | 216 | 30 | 186 | 97 | 347 | 9.3 | 237 | 6.5 |
| 25 | 165 | 4.0 | 256.50 | 36 | 226.50 | 135 | 425 | 9.2 | 270 | 6.1 |
| 30 | 200 | 4.0 | 296 | 41 | 255 | 180 | 492 | 8.85 | 286 | 5.4 |
| 37.5 | 237 | 4.0 | 343.50 | 45 | 298.50 | 220 | 578 | 8.6 | 325 | 5.2 |
| 50 | 320 | 4.0 | 423 | 62 | 361 | 250 | 742 | 8.1 | 447 | 5.3 |
| 75 | 500 | 4.0 | 529 | 93 | 436 | 290 | 1,000 | 7.3 | 668 | 5.1 |
| 100 | 610 | 5.0 | 635 | 125 | 510 | 330 | 1,190 | 7.9 | 816 | 6.0 |
| 150 | 840 | 5.0 | 810 | 187 | 623 | 380 | 1,555 | 6.8 | 1,118 | 5.9 |
| 200 | 1,100 | 5.5 | 937 | 250 | 687 | 420 | 1,885 | 7.5 | 1,405 | 6.3 |

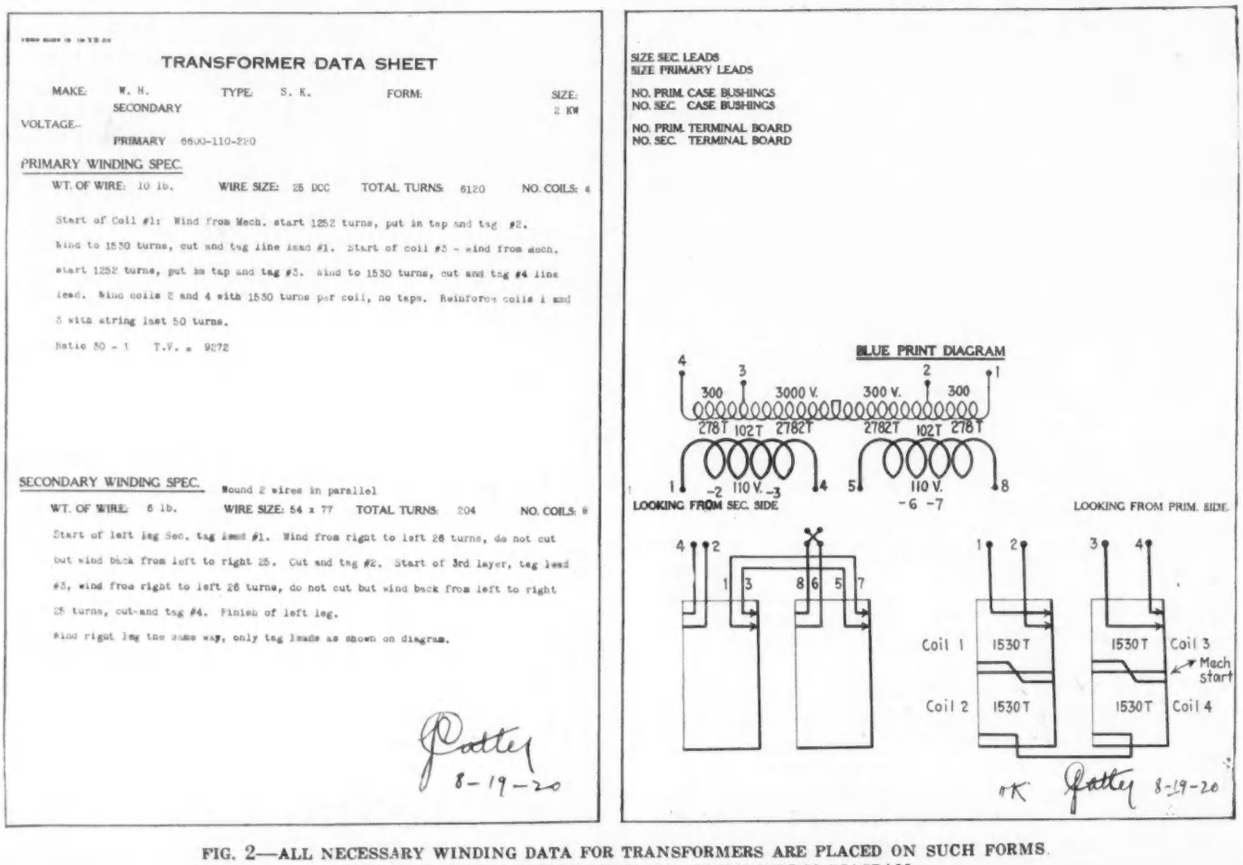

TRANSFORMER DATA SHEET
MAKE: W. H. TYPE: S. K. FORM: SIZE: 2 KW
SECONDARY
VOLTAGE--
PRIMARY 6600-110-220
PRIMARY WINDING SPEC.
WT. OF WIRE: 10 lb. WIRE SIZE: 25 DCC TOTAL TURNS: 6120 NO. COILS: 4
Start of Coil #1: Wind from Mech. start 1252 turns, put in tap and tag #2.
Wind to 1530 turns, cut and tag line lead #1. Start of coil #3 - wind from mech.
start 1252 turns, put in tap and tag #3. Wind to 1530 turns, cut and tag #4 line
lead. Wind coils 2 and 4 with 1530 turns per coil, no taps. Reinforce coils 1 and
3 with string last 50 turns.
Ratio 30 - 1 T.V. = 9272
SECONDARY WINDING SPEC. Wound 2 wires in parallel
WT. OF WIRE: 6 lb. WIRE SIZE: 54 x 77 TOTAL TURNS: 204 NO. COILS: 8
Start of left leg Sec. tag lead #1. Wind from right to left 26 turns, do not cut
but wind back from left to right 25. Cut and tag #2. Start of 3rd layer, tag lead
#3, wind from right to left 26 turns, do not cut but wind back from left to right
25 turns, cut and tag #4. Finish of left leg.
Wind right leg the same way, only tag leads as shown on diagram.
Pattee 8-19-20
SIZE SEC. LEADS
SIZE PRIMARY LEADS
NO. PRIM. CASE BUSHINGS
NO. SEC. CASE BUSHINGS
NO. PRIM. TERMINAL BOARD
NO. SEC. TERMINAL BOARD
BLUE PRINT DIAGRAM
4 3 2 1
300 3000 V. 300 V. 300
2781 102T 2782T 2782T 102T 2781
1 -2 110 V. -3 4 5 110 V. 8
-6 -7
LOOKING FROM SEC. SIDE
LOOKING FROM PRIM. SIDE
4 2 1 3 8 6 5 7
1 2 3 4
Coil 1 1530T 1530T Coil 3
Mech start
Coil 2 1530T 1530T Coil 4
OK Pattee 8-19-20

FIG. 2—ALL NECESSARY WINDING DATA FOR TRANSFORMERS ARE PLACED ON SUCH FORMS. THE BACK OF THE FORM IS USED FOR THE WINDING DIAGRAM

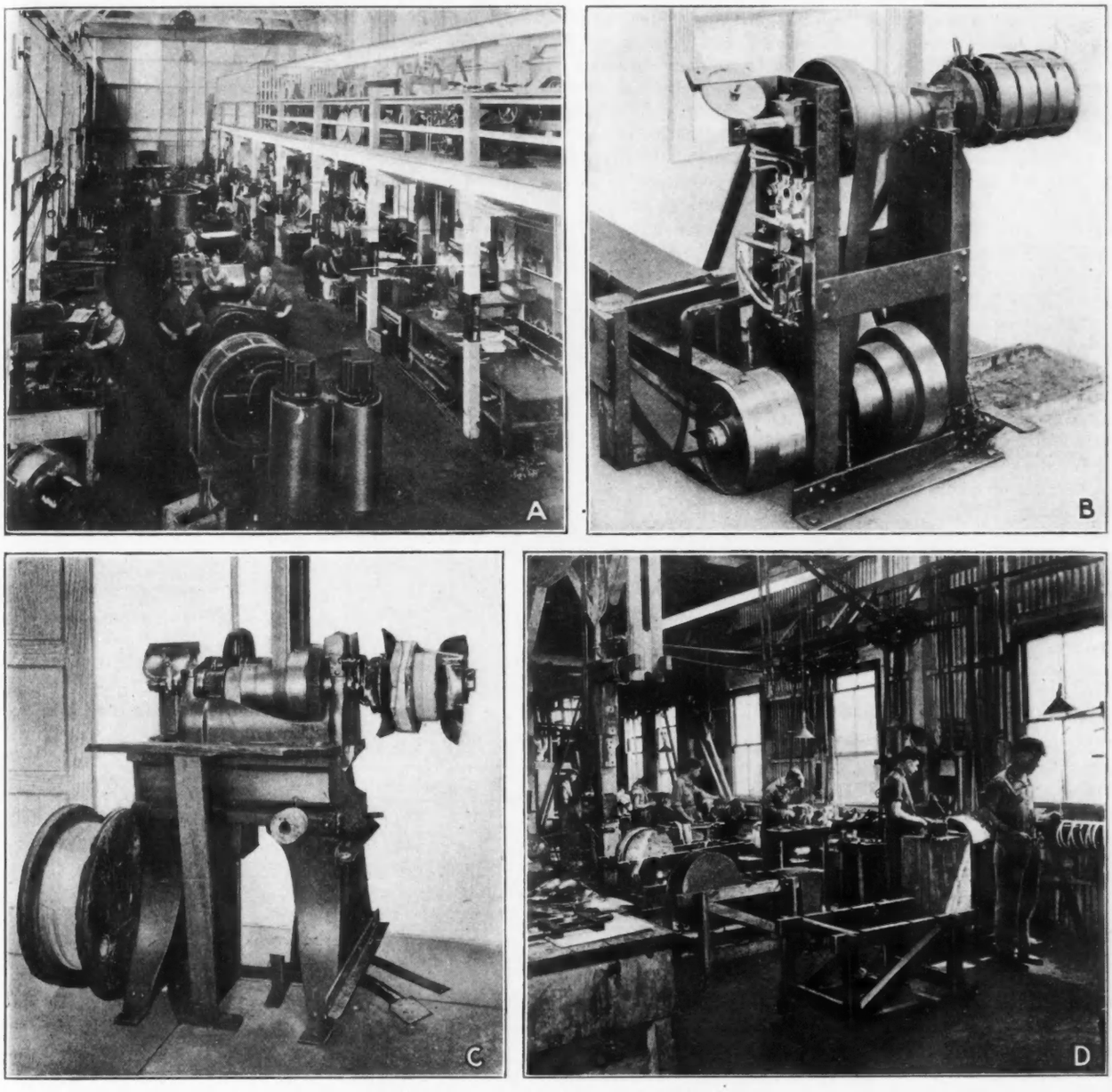



FIG. 3—INSIDE THE TRANSFORMER REPAIR SHOP

A—Compact arrangement of repair shop facilitates use of factory methods. B—High-speed coil-winding machine is adaptable to small jobs. C—A rebuilt lathe makes an admirable winding machine. D—Coil-winding machines are grouped closely.

tion of other companies but also to the large amount of new business, the transformer requirements have been on a very large scale and the special uses which call for odd voltages have been many. In 1910 one winding machine in the shop took care of all the rewinding, whereas at the present time there are sixteen such machines in operation for performing the work.

### APPLICATION OF FACTORY METHODS

Owing to the large number of transformers that pass through the shop (in 1920 there were 673 rewound and 1,955 repaired) factory methods have been used in many ways to cut the repairing cost down to the lowest figure possible. The transformers are segregated into groups according to size, voltages and class, which makes it possible for a workman to become especially familiar with one particular character of work, thereby gaining speed and efficiency. It is the practice to assign a dozen or more transformers to a certain journeyman winder for his personal charge. He has three or four helpers assisting him and has the use of two or three winding machines. The journeyman works at the bench where the dismantling and reassembling is done and attends to the procuring of the material, such as insulation, wire, tape, etc., and oversees the winding of the coils. In fact, it is his personal responsibility to see the job completed and "O. K.'d" by the testing department, and at a cost that is reasonable. The necessary winding data are supplied the journeymen by the general foreman on forms, as shown in Fig. 2. This form eliminates guesswork and can be used over and over again for all similar transformers.

It is obvious that on a system the size of the Southern California Edison Company, which has more than

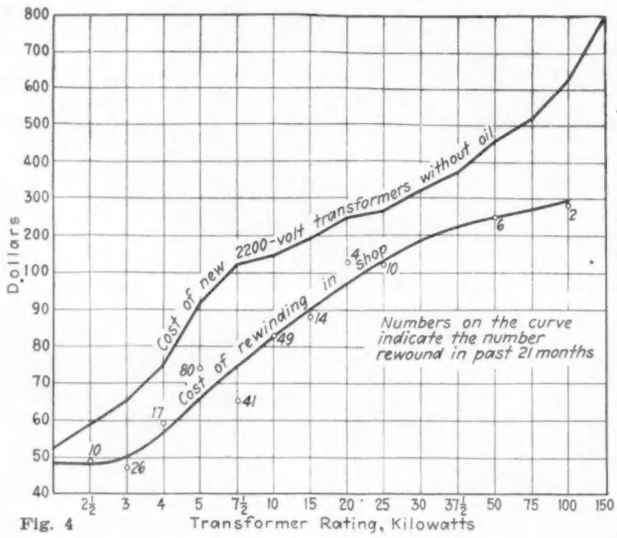
35,000 transformers in service, almost every conceivable kind of transformer is encountered and the experience of the men in the transformer department becomes very general. Even with a shop the size of this, it has not been found practicable to adopt piece work, but another plan of showing costs and putting each man on a competitive chart has been of value. The chart shown in Fig. 8 is kept posted in the winding room and is an individual record of each job. The vertical scale is divided into dollars and the horizontal scale into kilowatts. Curve A shows the cost of various sizes of transformers of a certain voltage; curve B is an assumed reasonable cost of a complete rewind for an individual transformer, and curve C is the actual average cost of rewinding. Curve C is lower than curve B because of quantity production and keen competition. As soon as a journeyman's job is completed and billed a small tag is pinned on the board, with the workman's name, the size and number of the transformers rewound and the unit cost. The position of this pin on the curve shows with what success the job was completed.

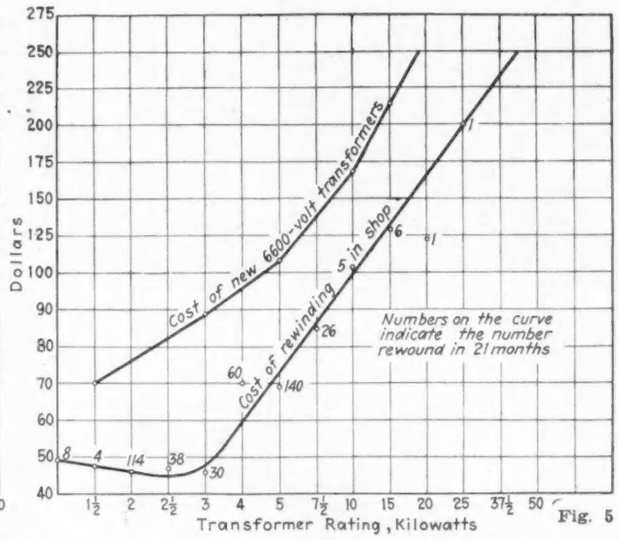
A record that has been kept of 6,600-volt transformers is shown in Fig. 5. The data shown were for a period of twenty-one months. It is interesting to note that quantity production is reflected in lower costs to such a decided degree. The costs of rewinding 2,200-volt, 10,000-volt and 15,000-volt transformers are shown in Figs. 4, 6 and 7.

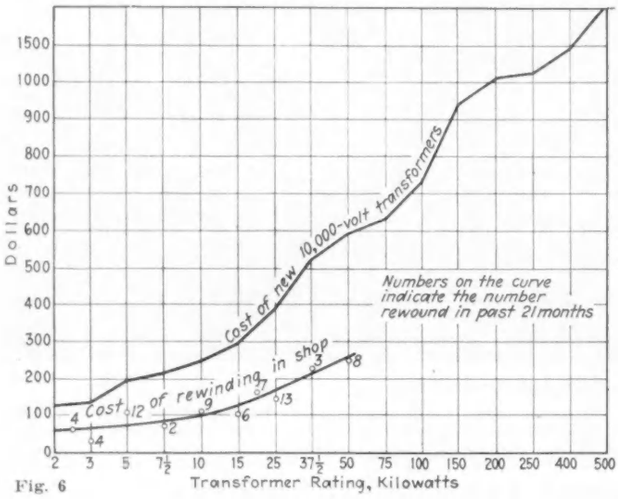
It is the constant aim to make all transformers as good as new, or better if possible, and therefore the best grades of insulating material are used. All rubber-covered leads are removed in the shop and cambric-covered leads installed. All short or damaged leads are also renewed. Old-style paper or cardboard barriers are usually replaced with mica board of some kind.

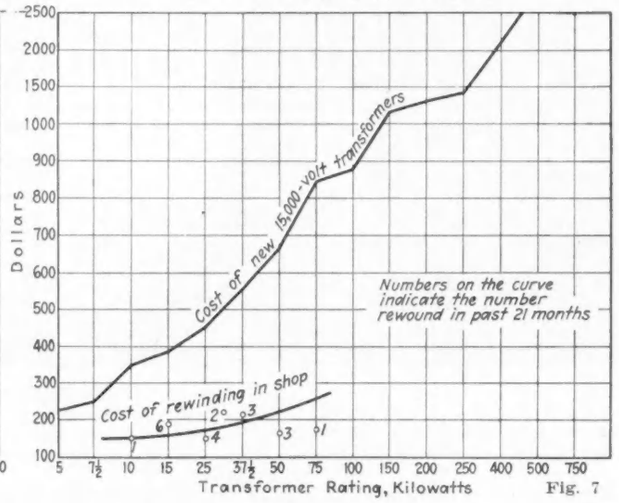
Fig. 3B shows a machine developed to do small winding that could be operated at high speed. This machine is operated by a 1½-hp. motor, and a tight and loose pulley is used for starting as it has been our experience that this method is more desirable than a friction clutch.

A winding machine is shown in Fig. 3C made out of an old lathe that had been in a fire and was reduced to junk value. It is the most flexible of all the machines used as the back gear gives it a great range of speed and lots of power for heavy work. It may be noted that the bed was cut in two, the legs were brought close together and the head was turned around on the bed. The left-hand pedal is a brake working on the small cone and the right-hand pedal controls the starting and stopping by operating the friction clutch on the jack-


Dollars
Cost of new 2200-volt transformers without oil
Cost of rewinding in shop
Numbers on the curve indicate the number rewound in past 21 months
Transformer Rating, Kilowatts
Fig. 4


Dollars
Cost of new 6600-volt transformers
Cost of rewinding in shop
Numbers on the curve indicate the number rewound in 21 months
Transformer Rating, Kilowatts
Fig. 5


Dollars
Cost of new 10,000-volt transformers
Cost of rewinding in shop
Numbers on the curve indicate the number rewound in past 21 months
Transformer Rating, Kilowatts
Fig. 6


Dollars
Cost of new 15,000-volt transformers
Cost of rewinding in shop
Numbers on the curve indicate the number rewound in past 21 months
Transformer Rating, Kilowatts
Fig. 7

FIGS. 4, 5, 6, 7—COST OF REWINDING TRANSFORMERS COMPARED WITH BUYING NEW ONES

shaft. Several of this type are in use, and they are not only cheap to make but better for general work than any other type in use in this shop.

The counter shown on the left-hand end of the shaft in Fig. 3B was developed for this particular kind of work and has now superseded all other makes of counters. It will count forward and backward at any speed with absolute accuracy. The small window on the right is for units, the elongated window in the center is for tens and the left-hand window for hundreds. It can be instantly set back to zero or locked so that the count cannot be tampered with. Moreover, a half revolution can be corrected, which is very important in starting a coil. The workman pays no attention to the counter until the wire is in position, when he turns the head over one-half revolution, and he is then ready to start the count. The counter is then set to zero, but in case it does not come exactly to that point it can be brought to zero by the adjusting screw on the end of the shaft. The Southern California Edison Company has found that it not only pays to rewind nearly all transformers, but the fact that a skilled force of men is constantly employed makes it possible to handle any emergency with the least possible loss of time, men and material being always available.

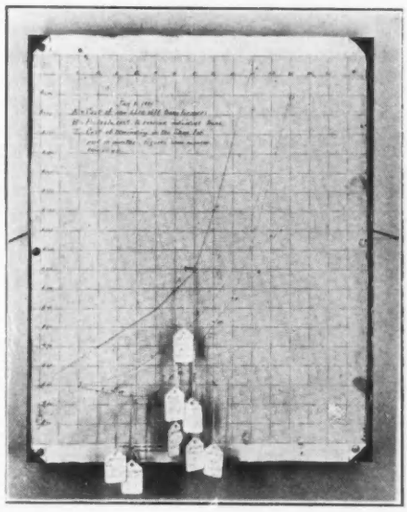


FIG. 8—A BULLETIN BOARD INDUCES COMPETITION BETWEEN WINDING CREWS

## Generating Electricity Within the Arctic Circle

AN ARTICLE in the London *Engineer* of recent date contains a comprehensive account of one of the northernmost electrical developments in the world—that at the Porjus waterfall in the extreme north of Sweden, within the Arctic circle. This hydro-electric plant serves the industrial interests engaged in mining the immense deposits of iron ore made accessible by railroad construction in comparatively recent years, 5,000,000 tons of iron ore being now exported annually from the district. In deference to the tourists one waterfall above the Porjus development has been permanently reserved as a scenic feature. The Porjus water power is a combination of rapids and falls, 1¼ miles long, which continue to the Gulf of Bothnia as the Great Lule River. Here three 10,000-kw. generators deliver energy at 80,000 volts over a 200-mile transmission line. The author says that the electric railroad now almost completed which runs through the vast forests of Lapland and of which Porjus will be the northern terminus crosses rivers capable of yielding 8,500,000 hp. No railroad probably has ever been built under greater difficulties.

# Simpler Disconnecting-Switch Practice Desired

### One Solution Is a New Form of Heavy-Duty Disconnecting Switch that Does Not Require Cumbersome Mechanism

BY J. ALLEN JOHNSON
Electrical Engineer Niagara Falls (N. Y.) Power Company

AS THE art of power generation and distribution has advanced the design of disconnecting switches has failed substantially to progress with that of other types. This has doubtless been due, at least in part, to the perhaps unconscious desire of engineers to preserve simplicity in the fundamentally simple function of disconnecting dead apparatus. But as systems have grown the use of disconnecting switches of the usual form in larger capacities has demanded the sacrifice of this simplicity by requiring the addition of operating mechanisms which have become more and more complicated. This situation has reached such engineering importance that today there is a strong feeling among some engineers that a return to simplicity in disconnecting-switch practice is desirable. But this necessitates new forms of disconnecting switches which can be operated easily by hand in large ratings. It was with this requirement in mind that the design of the switch shown in the accompanying illustrations was undertaken.

#### COMPLICATIONS INCREASED WITH SIZE OF SWITCH

Any one familiar with the history of electrical distribution will recall how as the capacity of systems increased it was found that disconnecting switches were often forced open in times of short circuits by direct electromagnetic action. This led to the use of latches. As systems still increased in size disconnecting switches grew so large that they became very difficult to operate by hand in the usual manner and the mechanically operated disconnecting switch appeared. At first very simple in character, the mechanism gradually increased in complication until at last the state of development arrived where the mechanism for operating disconnecting switches became almost as complicated as that for operating the oil switch itself. Then, finding virtue in necessity, the presence of this complicated mechanism suggested the possibility of electric and mechanical interlocks between the disconnecting-switch and oil-switch mechanisms, thus adding still further complication, and now finally has come the proposition that the oil-switch mechanism be actually made to operate the "disconnects" also.

Besides this complication, the faults of the switch itself became more apparent as larger sizes were made. As the larger sizes are hard to open or close, there is considerable strain in the insulating supports. After a switch has been closed for some time it may "freeze." To open the switch great force must be exerted, which may loosen the mounting. Besides being difficult to open these switches are difficult to close. Often they cannot be closed with a steady push, but must be shut with a bang, which may also result in injury.

An analysis of the construction of a knife switch brings out another inherent disadvantage. It has been established that the resistance of a contact depends upon contact pressure; therefore heavy pressure is necessary at the contacts of a knife switch designed to carry heavy

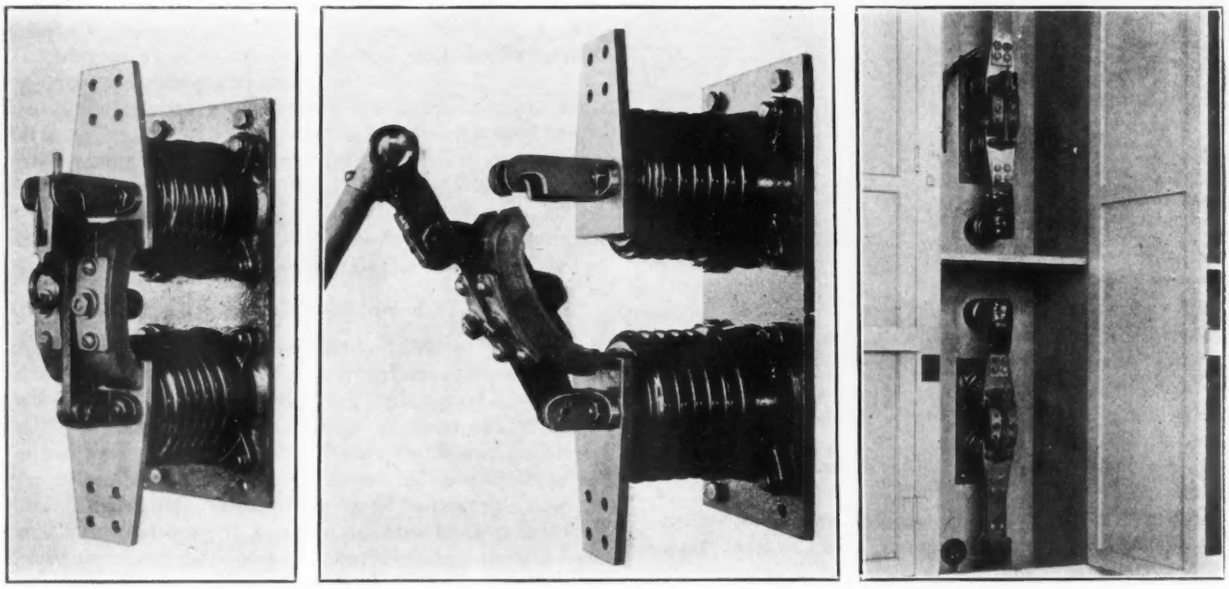
currents. But heavy pressure also makes the switch more difficult to operate. Cutting at the hinge may result if the switch is not kept lubricated. If a switch is once cut, it will not carry heavy loads without burning.

An attempt was made in the design shown to overcome these weaknesses. This switch has a bridge member consisting of laminated copper brushes flexibly mounted upon a bronze bar or frame which is pivoted on a steel pin. Contact pressure of positive and definite magnitude is obtained by means of a simple eccentric device, and the same movement which applies pressure to the contacts also effectively locks the switch in the closed position. As shown in the illustration, the switch is operated by an ordinary hook stick which is inserted in an eye on a swinging arm mounted on the hinged bar. This arm holds a pin which is slightly eccentric to the hinge of the arm. After the switch is pushed into position by the stick the arm is pushed up, causing the eccentric pin to engage with two hooks mounted on the stationary contact. The arm is then rotated downward, the movement of the pin exerting a heavy pressure on the contacts. As the pin cannot come out of the hooks unless the arm is swung outward from the closed position by means of the hook stick, the switch remains locked even with a heavy current surge.

Switches of this type in any reasonable rating may be operated by one man with an ordinary hook stick. No great force or violent motion is necessary for either closing or opening the switch, so that the insulators cannot become loose or be weakened from this cause.

The almost straight path of the current through the switch is very favorable under short-circuit conditions, as there is little tendency for the brushes to lift, and this tendency is overcome by the strong and definite contact pressure created and maintained by the eccentric locking device. Should the contacts in any way become burned or require redressing, it is a very simple matter to remove the brushes for this purpose, or, if desired, new brushes can be installed in their place without sacrificing the remainder of the mechanism of the switch.

Another advantage of the new type of switch is the interchangeability of the parts. A switch originally installed, say for a capacity of 1,000 amp., can be easily changed to a 2,000-amp. switch by mere substitution of new current-carrying parts. Very little dressing, grinding or fitting is required. An adjustment is provided to allow for slight inequalities in brushes, and a slight flexibility in mounting permits each contact surface to adjust itself to a perfect bearing.



THIS DISCONNECTING SWITCH CAN BE OPENED AND CLOSED WITH LITTLE EFFORT

At the right is shown the switch as it appears installed in a plant of the Niagara Falls Power Company

TEMPERATURE RISE OF DIFFERENT PARTS OF 2,000-AMP. BRUSH-TYPE DISCONNECTING SWITCH

| Part of Switch | Temperature Rise, Deg. C. — At Rated Current | At 125 per Cent Rated Current |
|---|---|---|
| Left-bottom contact | 20.1 | 26.2 |
| Left-top contact | 18.2 | 23.2 |
| Right-top contact | 19.9 | 29.2 |
| Right-bottom contact | 20.7 | 31.2 |
| Center of brush | 20.6 | 28.2 |
| Top connection | 20.5 | 28.7 |
| Bottom connection | 19.4 | 28.2 |
| Air temperature, deg. C | 24.1 | 25.3 |

It might be thought that the passage of a portion of the current through the bridge and locking mechanism would cause trouble, but such has not been found to be the case in practice. The conductance of the bridge and locking mechanism is so small compared to that of the brushes that very litfle of the current passes through it, and no unequal heating results.

A 2,000-amp. switch of the type shown, when operated continuously at full load and 25 per cent overload at 25 cycles, gave the temperature rises shown in the accompanying table. From the results it will be noted that the temperature rises at rated current are only about 20 deg. C. and almost uniformly distributed. Even at 25 per cent overload they are well within safe limits, as their temperature is only about 31 deg. C. above room temperature.

This switch is being made under the writer's patent by the Electric Power Equipment Corporation of Philadelphia.

# What a New Customer Thinks the First Day

## A Picture of the Reaction from a Bad First Impression—Friendship or Hostility Depend on Early Contacts with the Company—"Human" Administration Essential to Confidence and Good Will

By H. A. LEMMON

*Personnel Manager Stone & Webster, Inc., Boston, Mass.*

PAINSTAKING scientists at the Smithsonian Institution can take a fossil bone and from it reconstruct the fossil framework of some prehistoric monster upon which the eyes of living man have never dwelt. From the incidents of his first day's contact with the public service company, Bill Jones, average citizen and voter, reconstructs this entire organization in his mind and fixes his present and future relationship to it. That Bill is the chap who decides the destiny of the central-station company was vigorously emphasized by H. A. Lemmon at the recent convention of the Stone & Webster Managers' Association in Boston. Throwing the spotlight upon the outworn methods of disregarding the individual, which still hamper too many utility organizations, Mr. Lemmon made this strong plea for a warm-blooded, man-to-man conduct of affairs which will dispel misunderstandings, create friends and insure a development of service mutually profitable to community and to corporation.

I WANT to paint a little picture of one of the very fundamental sources of trouble in the relationship between the central-station company and the people. It is the little matter of the first impression out of which grows the opinion, attitude and influence which every householder maintains to either the benefit or the disadvantage of the public utility company. Here is the picture. Bill Jones and his family and their small possessions arrived in their present home one Saturday morning, and with the unpacking and lugging of goods into the house it was early afternoon before any of the family chanced to think of electric lights and gas. Two or three of the cords had lamps swinging at their ends, but neither the snapping of the key nor the turning of the cocks produced any results. Vaguely Bill knew that for some reason these services had been disconnected, and so notwithstanding his anxiety to get the beds up and the range working he saw no way out of it but to clean up and walk over to a neighbor's to telephone to the gas and electric company.

Mrs. Jones had reminded him that the next day was Sunday and the following day was a holiday, giving him a list of groceries which she must have before evening. He called up the grocery store first. A pleasant voice responded and took his order. Bill said it must be delivered that evening. The voice explained that his order was in too late to go out on one of the regular deliveries, but that it would certainly be sent out specially and would surely arrive in the evening. It did.

### No Service Without an Office Call

Then he called up the gas and electric company, apologized for forgetting to order his service reconnected before and rather awkwardly explained the situation. The voice at the other end broke in impatiently: "You'll have to come to the office and sign up." Bill ventured to suggest that he could come in Monday or Tuesday. "No," said the voice; "you'll have to come into the office and sign up if you want lights or gas," and the tone indicated that the conversation was ended.

Bill "cussed" a bit, but he hurriedly went home and Mrs. Jones finally found his other clothes in the big box. Bill donned them and trudged off for the office of the public service corporation. It was only a twenty-minute walk, and at quarter of three he entered the portals of a big establishment which he thought must be a bank.

There was a mahogany counter surmounted by curlicues and rods in polished brass, punctuated here and there with inhospitable portholes. He glanced over these, but none of the eyes he met staring out from them conveyed an invitation, and so he fell into the line which he observed lock-stepping its way to the one which appeared the most popular. After ten minutes, which seemed to Bill an hour as he thought of the things he must accomplish that night, his turn at the window came. "I want to get lights and gas connected at 978 Fairfield Street," began Bill, when he was interrupted by the caged inmate with a terse "Contract window!" and a glance of dismissal which tried to look past and around Bill to the next person. Bill didn't quite catch the significance of the remark nor the in-curve glance and so he started to repeat. "Contract! I said," came the interruption again, this time quite conclusively. Bill grasped the idea that he was wrong for some reason or the other and stepped aside to think it over.

One of the lock-step gentlemen took pity on him and said: "He means you are to go to the window marked 'Contracts.' You only pay bills at this window." Bill stumbled a bit both mentally and physically to the designated porthole, and notwithstanding the impersonal glare which met him told the story of his requirements.

### No Point of Personal Contact Here

The proposed transaction seemed to be quite an important one to Bill, but was received in silence and was only interrupted by the clerk thrusting a card at him with the command, "Sign here." Bill started to read the very fine print he was ordered to sign, but this proceeding was so evidently out of order that finally he hastily appended his signature. Could he have service that afternoon? "Information" was the only word shot back at him. He had learned much by this time, however, and he looked about and found a place so designated. He told his story for the third time here in part, and the clerk wanted to know if he had signed an application card. Bill didn't know. He had signed something at another window. With a bored and resentful air the clerk walked over and presently came back with the card, which in turn he handed to a boy who disappeared with it into the mysteries concealed by a partition.

Bill didn't know that back there they were going over the book of bad bills to see if his name appeared there. In time the card was returned. The information clerk

scrawled his initials upon it and began to fill out another blank.

"Ten dollars."

"What?" said Bill.

"Ten dollars—a deposit."

Bill didn't have the ten dollars with him; he would have to walk home to get it. Could he bring it in or send it Monday? He could not. The deposit must be made before he could receive service. Bill trudged home, got the ten dollars and trudged back. He wasn't tired. There were surging up within him emotions which anesthetized any feeling of weariness which he might otherwise have felt.

### No Sympathy Here

There was no delay in getting to the right window this time. Bill was learning the ropes of that mysterious place of business. He paid the money, got a receipt and the clerk finished filling out the second blank. Rather timidly this time, Bill again started his tale of the inconvenience which would fall upon his little family if he couldn't have service that night. Bill had never walked into a bank and asked the cashier to give him a million dollars, but he knew exactly what the sensation would be from the look he received at that desk.

"The wagons went out on their last trip two hours ago. We cannot connect any more tonight," was the answer. Bill ventured the opinion that the morrow was Sunday and the next day was another holiday, but apparently this statement had no element of news in it, for it met with nothing but a yawn and a glance at the clock. The incident was closed.

I relate this story because I have seen it enacted not once but many times. All or part of it can happen with many more companies than any of us want to confess. From the incidents of that first day's contact Bill Jones constructed the entire organization of the lighting company in his mind and so fixed his present and future relationship to it. This point of contact might have been through the collector, the meter reader or any other so-called minor representative of the company, and the result would have been the same. Yet Bill is the chap who decides the destiny of our franchise amendments, and our obligations, and our applications for increased rates, and our dividends.

### Groceries Are Understood

Mr. Jones' grocery bill is very nearly $40 per month these days as against $25 six years ago. If his grocer prospers until he occupies his own building and has a stock worth $50,000 Bill doesn't care and in fact is rather proud of it. He likes to associate himself with successful people and institutions. He mildly resents the increased price of groceries, but in the back of his head is the fact that, while the cost of living has risen, his wages or salary has also advanced.

But if the lighting company to which Bill Jones pays an average of $2.20 per month proposes to increase that amount by 20 cents, Mr. Jones is indignant, then enraged, and is not content until he has invoked all the powers and resources of his citizenship to combat the "outrage." Why? Lack of understanding. Lack of understanding that corporations are subject to the same immutable economic laws that govern the grocery business. He rather imagines that the directors get together in the back room about once in so often and by incantation and other mysterious hocus-pocus create money out of the air, as it were. It might make a better citizen, customer and neighbor of Bill if the mechanism of the company should be taken apart and the pieces spread out in the open for him to handle and understand. Assuredly it would be better for the lighting company.

### Customer Ownership Would Help Here

Bill doesn't know, though he is capable of understanding, that while his grocer turns his capital four to six times a year, the lighting company does it once in six years. He doesn't know that an incorporation is merely a convenient form of association of people just like himself; that many of the stockholders are just his kind of folk who have taken their little savings out of the bank for investment; that not one in ten is of the plutocratic stratum of which he is so suspicious; and he doesn't imagine that the company's affairs could be openly presented and understandable. He would be astonished to know that there are 2,700 stockholders in his company instead of the ten or twelve he has pictured, and that the "little fellow" receives exactly the same dividend per share as the larger holder.

He does not realize that the state itself establishes and scrutinizes the form of bookkeeping used by the utility; that there can be no stock-jobbing deals because the state supervises security issues, fixing the price thereof and the rate of return upon the capital invested; that it fixes his lighting rate to produce no greater sum than is needed for a reasonable return only; that the state examines all the operating expenses, prescribes the sort of service which he may receive to the full value of his money and, in short, oversees every step in his relations to the company, guarding his individual interests more perfectly than in any other business.

### No Revenue Except from Earnings

It didn't help Bill any to learn that the increase in his lighting bill was due to a coal clause. So far as he knew, he hadn't used any coal clauses; but he could have known and would have approved of the underlying principle had it been properly presented to him at the right time.

He had never had it made entirely clear to him that money itself is entitled to an annuity. At present he feels that interest earned upon the investment is *profit* instead of being an *expense* of doing business; but very little effort would convince him. Likewise he resents the fact that the patrons of the company are required, through enforced rates, to pay taxes and other overhead expenses. He thinks the stockholders ought to bear these burdens, and yet he could be made to understand that the company can only pay out money which it has first taken in, and that its only source of revenue is the sale of its product. He has visions of a very fat treasury and of great sacks of gold in the company's vaults, and yet he is fully capable of understanding that under state regulation all expenditures for additions and betterments must come from without the company itself. He will be far less antagonistic to the company after he has learned all this. He is fully capable of understanding that in the end the customers of the company and the community at large suffer far more than do the stockholders if the company is kept in a semi-starved condition.

Bill does not realize that the fundamental reason why the company enjoys a monopoly—has no competition—is because the business isn't profitable enough to offer temptation. If the company is a potential monopoly,

the protection is really to the people of the community rather than to the stockholders.

Bill has heard a local politician talk about the valuable franchise the city gave the company, and he curses the councilmen who in that remote day gave away his rights to the corporation. He doesn't understand that a franchise is a thing which the city exacts—not something which it gives—merely a license to do business, just as his grocer friend required, only the grocer didn't have to submit to so many vexatious restrictions before he began operations. He waxed indignant as he listened to a discussion of how the use of the streets was given to the company, it not being called to his attention that the use of the streets was not given to the company but to himself in order that he and its other customers might be supplied with light. The use of the streets is also given to Bill's grocer friend for the delivery of his goods, as well as to every other citizen and merchant in the place.

If the grocer were taxed for each delivery wagon, and if he were charged a high license, and if his rent were increased, he would have to charge more for his goods, and Bill Jones and his like would pay these increases. He understands that if the city makes it possible to supply service to him at less cost than would otherwise be the case, he reaps the benefit—not the company. Jones would be a strong advocate of the service-at-cost theory if he really knew what it was and believed it would be honestly handled.

### Too Much Technical Language

Bill and his neighbors read in the papers that it costs the company about 2 cents a kilowatt-hour to generate electricity, and they didn't understand why, such being the case, they had to pay 12 cents for their lighting. So a little self-elected committee of them called on the manager one day to find out. He was just going out, but he set down his golf bag—Bill and his neighbors don't play golf—and he completely submerged, bombarded, incrusted and asphyxiated them, between nervous glances at his watch, with such terms as "distribution costs," "reserve plant capacity," "transformation and line losses," "obsolescence," "depreciation," "overhead" and "development costs." They didn't find out what they wanted to know, and they felt sure that if there had been any satisfactory explanation, certainly he would have told them—and have told them in English—so they knew he couldn't justify such charges. The candidate for member of the City Council had no difficulty in explaining the situation to them—"it was just plain robbery."

But when Mrs. Jones went into the grocery store to pay her bill three or four of the clerks smiled and had a word of greeting as she passed on her way to the cashier, and the latter wanted to know how her boy was getting along in high school and whether she had put up her blackberries yet. They were glad to see her and to have her custom. When she paid her electric light bill perhaps the people there were glad to get the money, also, but they didn't know her name and they certainly gave the impression they were conferring a favor upon her by accepting it. As she passed the Federal building on the way home, it occurred to her that the atmosphere at the electric light office, when she paid her bill, was precisely the same as at the post office when she purchased a postal order—impersonal and studiously courteous. Also, when she went into the electric office and talked lights, the people there talked voltage and watts, and how could she enjoy calling upon people whose language she could not understand?

### No Central-Station Profiteers

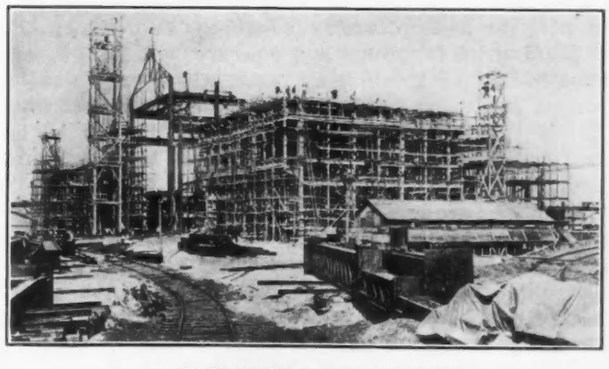
Bill has heard a lot about profiteering during the war and since. But no one has shown him that of all the people with whom he has done business he may be most certain that the lighting company has done no profiteering. The figures haven't been presented to him, and so he doesn't know that while the cost of living has increased over 140 per cent, his lighting bill has increased only 17 per cent.

Bill Jones is the public—our typical citizen, the man in whose mind lies the destiny of the public utilities, and the man to whom courts and commissions are directly responsible. He creates them. Don't we want him to know these things and others? How can he know them when not even one in ten of our own employees knows them—and that is the most damaging statement that can be made of any institution doing business with the public. We want Bill Jones to know all our cards face up on the table, because until he does he will never yield to us that to which we are entitled. The public must know all the principles governing our business and must be informed frankly and earnestly. Bill Jones is a bottle. What he thinks has first been poured into him. How much of his contents have we contributed?

Some men will say that these implied refinements in handling customers and keeping them informed are a passing fad, akin to psycho-analysis or something of that sort. In reality, they are simply recognition of human nature as it is. Failure to study human nature has wrecked railroads and it will wreck other utilities as readily. There is no lasting protection against confiscation of capital invested in public service save public confidence and good will.

## Water-Cooled Generators in 200,000-Kw. Plant in Paris

FIVE 40,000-kw. turbo-generators, three of which will be water-cooled, are to be installed in the Centrale de Gennevilliers, Paris. The turbines will operate on a pressure of 320 lb. and a superheat of 350 deg. Fahr.



A SUPERPOWER PLANT FOR PARIS

The generators will be connected to 6,000/60,000-volt transformers without intervening low-tension buses so that the generators and their respective transformers will operate as units. The accompanying illustration shows the station as it appeared the middle of last summer.

# Field of Electric Heat Treating Extending Rapidly

## Used in Diversified Industries—Baking of Water Japan an Important Development—Ease and Accuracy of Control Important Featur.

DESPITE the depressed industrial conditions, there has been a very satisfactory extension during the past year of the application of electrically heated ovens, ranging from the japanning of such small articles as shoe eyelets and camera parts down through the baking of foundry cores to the treatment of large castings for use in the manufacture of automobiles. In addition there has been increased use in the older application of japanning the sheet-metal parts of automobiles.

The use of the electric oven for baking water japan is perhaps one of the most important applications of the past year. The problem has been to secure ventilation that will prevent disastrous explosions with the least sacrifice of heat from the furnace. One automobile-plant installation made in the last year for japanning purposes and to heat-treat cylinder blocks, cast-iron pistons and parts of engine-crank cases is particularly interesting because of the tendency it indicates in the atuomotive field to make extensive use of the electrically heated oven in all operations requiring the use of heat-treating or baking.

The use of the electric oven in the manufacture of shoe eyelets presents an example that is interesting not only because of the small size of the article treated but because of the ability to get along without the large amount of ventilation required in larger furnaces. Allied with this use in the relative size of the parts is the use of the electric oven in the camera-manufacturing industry for the japanning of small parts. Another application is the heat-treating of ball-bearing parts to relieve internal strains that may have been incurred in the tempering or hardening process.

### DIVERSIFIED APPLICATIONS AND DEVELOPMENTS IN ANNEALING FIELD

The electric oven is also being applied to the baking of the armature and coils for such small machines as those used in automobile starting and lighting equipment. The dental industry is making use of the oven in japanning of furniture and equipment parts. In one case mahogany graining is produced on metal that is almost impossible to distinguish from the actual wood finish. The pencil-manufacturing industry has applied the electric oven to the baking of pencil leads, with improved results over the older furnaces. Food-products companies have applied it in the dehydration of fruits and vegetables. Rapid progress in bread and pastry baking is being made as installations in use prove themselves in unit operating costs, better product due to heat control and a greater volume of finished product from the same amount of raw material. The Navy Department is making use of the electric oven for core-drying purposes in its foundry work and also at several of the navy yards for baking the metal furniture that is used on shipboard.

Developments continue rapidly in the brass, aluminum and glass-annealing field. Cases have been noted where in brass annealing the process has been reduced in time from approximately six hours for the fuel-fired furnace to less than one-half hour. In the treatment of sheet aluminum used in the manufacture of kitchenware the treatment of forty-eight hours or more required in the fuel-fired furnace where the materials have been stacked solidly has been reduced in the electric furnace to less than one-half hour. In doing this the charges have been reduced and the materials spread out so that the heating up process is less one of soaking than it is of getting the heat quickly to all parts of the materials under treatment. In the glass industry one case noted in the manufacture of fine glassware has shown a remarkable increase in the better grades of the product due to the heat control and the absence of the detrimental fumes met with in the fuel-fired furnace. In this case a small percentage of the samples selected at random by the manufacturer in a test showed the largest percentage as grade C, whereas a similar number of samples taken from the electric furnace showed almost 100 per cent grade A. Very much the same results have been obtained in the hand-painted, high-grade china industry. With the fuel-fired furnace some authorities have placed as the expected defective product a figure of 20 per cent. This is not unusable product, but simply that below 100 per cent condition. With the electric furnace this figure is in the neighborhood of 1 per cent. In addition the colors retain more life, owing to the absence of the detrimental gases that even in the muffle type of fuel-fired furnace cannot be entirely excluded.

### FEWER REJECTIONS EXPERIENCED THAN WITH FUEL-FIRED

Cutlery manufacturers have also found a lesser number of rejections from the product of the electric heat-treating furnace. One optical company with a large number of furnaces has found that qualities of glass can be obtained with the electric furnace that are impossible with any other type. The furnace is also being used in the manufacture of vehicle springs.

Not including experimental furnaces and those for purely laboratory purposes, the range of development in manufacturing work shows electrical capacities ranging from 25 kw. to 30 kw. for the furnace used to handle small parts up to 720 kw. for annealing ingots on heavy forgings.

While it is impossible to fix definitely the field in which any given type of oven should be used, the tendencies based on the production involved may be indicated as follows: For small production the shelf type is used extensively, and if the parts are small and diverse the drawer type is useful. The fixed-shelf oven is special and rather limited in its field owing to high operating costs.

For larger work and somewhat larger production the rack, truck or car type ovens generally meet requirements. Next in order is the gravity type with the inlet higher than the outlet. This is used where the pieces are rather bulky and not many are handled per day. It is extremely flexible as to time of bake. The angle iron or I-section trolley type may be classed with the gravity type. The intermittent conveyor type, covering such typical work as japanning the sheet-metal parts of automobiles, conduit parts and the sheet-iron cases by which so much equipment of all kinds is protected and where the production is large and uniformity of results is important, is very much used. It is probably the most nearly standardized type of oven because of its more extensive use. The continuous-conveyor type is the one that is applicable to cases where the largest possible production is desired.

# Operating Expenses of Six Plants

## Study of Massachusetts Stations Emphasizes the Advantages of Electrical Equipment from Upkeep Standpoint—Data Indicate Changes Which Are Taking Place as Result of Transition to New Industrial Basis

ELECTRICAL installations keep on making records in economy year after year in plants of many kinds, and nowhere can this be better seen than in the central-station itself. The comparatively small cost of maintaining generating switchboard and other electrical apparatus when weighed against the annual outlay required to keep steam-plant equipment in first-class condition is significant to the analyst of power-plant operation and to the sales force no less.

The latest available maintenance data from six of the better central stations of Massachusetts shows that the "steam end" of such a plant today requires easily three to six times as much money per year for upkeep as does the "electrical end." To broaden the freedom of discussion, the plants are presented here by letters instead of by name, but the data printed are all based upon returns to the Massachusetts Department of Public Utilities for the year ended June 30, 1921. The six stations selected for a brief analysis of their maintenance expenses ranged in capacity during the above period from 18,437 kva. to 77,500 kva. This capacity represents the mean rating of each plant during the year.

The plants are all of the "straight" steam type, without hydro-electric supplementary stations owned by these companies, although in two cases, stations C and F, interconnection with hydro-electric systems is in regular service. These stations are thoroughly modern in design, for the most part, with water-tube boilers, mechanical stokers and turbo-generator units of reasonably good economy. They serve cities and surrounding territories in some cases of from 100,000 to 200,000 population, and are being ably managed.

TABLE I—OPERATING AND MAINTENANCE EXPENSES OF SIX MODERN MASSACHUSETTS COMPANIES

| Company | Kw.-Hr. Generated | Station Operating Expenses | Plant Maintenance Expenses: Building | Steam Equipment | Electric Equipment | Total | Average Plant Rating, Kva. |
|---|---|---|---|---|---|---|---|
| A | 34,232,840 | $542,748 | $4,529 | $23,355 | $9,432 | $37,316 | 23,150 |
| B | 29,194,096 | 672,803 | 8,472 | 25,166 | 6,675 | 40,313 | 25,787 |
| C | 29,056,200 | 289,935 | 2,525 | 22,946 | 2,349 | 27,820 | 18,437 |
| D | 30,144,388 | 580,852 | 4,029 | 36,830 | 5,482 | 46,341 | 20,265 |
| E | 81,691,800 | 1,050,390 | 23,819 | 52,427 | 8,233 | 84,479 | 77,500 |
| F | 63,140,000 | 983,159 | 23,135 | 100,712 | 14,138 | 137,975 | 59,700 |

In general, these plants are undergoing a gradual development from pre-war stations of moderate load-handling abilities to post-war plants "set" for the great task of furnishing energy economically to broadening or intensifying markets. Their total sales of energy in the year referred to above ranged from 23,613,941 kw.-hr. to 69,507,076 kw.-hr. Their station operating expenses, exclusive of purchased energy, ranged from $288,935 to $1,050,390, the former being due to a very large purchase of energy by station C and the latter to the operation of the plant (E) as an independent installation with no interconnection of any importance.

Turning to the maintenance data yielded by these six companies for the year, it will be noted that the total station upkeep represents a very small proportion of the total operating costs of each plant. Data as to outputs, total plant expenses and total maintenance costs are given in Table I. The actual plant maintenance costs ranged from $27,820 per year in station C, a large purchaser of energy, to $137,975 in the case of station F. These sums are not insignificant and are worthy of attacking from the efficiency standpoint on the principle that a dollar saved is a dollar earned; but in comparison with the total production costs of these installations (in which high-priced coal cut so much figure) maintenance expenses are modest indeed. This is emphasized in Table II in terms of cents per kilowatt-hour generated for the three leading items of plain maintenance outlay. In only one case does the total plant upkeep exceed 2 mills per kilowatt-hour, and in the other cases it runs always below 1.6 mills. Usually, too, these plants have to spend only between 6 and 10 cents for maintenance for every dollar expended in operation, and from every dollar of revenue from the sale of electricity these stations have to devote only from 2.1 to 5.9 cents to upkeep of plants.

TABLE II—MAINTENANCE EXPENSES IN CENTS PER KILOWATT-HOUR, IN PERCENTAGE OF OPERATING EXPENSE AND PER DOLLAR OF REVENUE

| Company | Plant Maintenance Costs in Cents Per Kw.-hr. Generated: Building | Steam Equipment | Electric Equipment | Total | Ratio Plant Maintenance to Station Operating Expenses, per Cent | Plant Maintenance per Dollar of Electric Revenue, Cents |
|---|---|---|---|---|---|---|
| A | 0.0134 | 0.068 | 0.0275 | 0.1089 | 6.9 | 3.1 |
| B | 0.029 | 0.0863 | 0.023 | 0.1383 | 6.0 | 3.1 |
| C | 0.0087 | 0.079 | 0.0081 | 0.0958 | 9.6 | 2.1 |
| D | 0.0134 | 0.122 | 0.0182 | 0.1536 | 8.0 | 3.9 |
| E | 0.0292 | 0.064 | 0.0101 | 0.1033 | 8.0 | 4.3 |
| F | 0.0365 | 0.158 | 0.0224 | 0.2169 | 14.0 | 5.9 |

Steam equipment exacts its toll in maintenance outlay, as Table III shows in detail. More than half the money expended on plant repairs in every one of these stations goes into keeping the "steam end" up to "concert pitch," and in some cases more than 75 cents per

TABLE III—RELATION OF STEAM AND ELECTRICAL MAINTENANCE AND REPAIR EXPENSE TO TOTAL

| Company | Ratio to Total Plant Maintenance Expenses (per Cent): Building | Steam Equipment | Electric Equipment | Repairs for Kva. Station Capacity: Building | Steam Equipment | Electric Equipment | Total |
|---|---|---|---|---|---|---|---|
| A | 12.1 | 62.5 | 25.4 | $0.196 | $1.01 | $0.408 | $1.614 |
| B | 21.0 | 62.3 | 16.7 | 0.329 | 0.976 | 0.26 | 1.565 |
| C | 9.0 | 82.3 | 8.7 | 0.137 | 1.24 | 0.127 | 1.504 |
| D | 8.7 | 79 | 12.3 | 0.198 | 1.82 | 0.27 | 2.288 |
| E | 28.2 | 62 | 9.8 | 0.307 | 0.675 | 0.106 | 1.088 |
| F | 16.7 | 72.5 | 10.8 | 0.386 | 1.67 | 0.237 | 2.293 |

TABLE IV—MAINTENANCE AND REPAIR EXPENSE OF DISTRIBUTION EQUIPMENT IN DOLLARS AND ALSO PER UNIT OF ENERGY SOLD AND DOLLAR OF REVENUE

| Company | Kw.-hr. Sold, Including Station Heating | —Maintenance Repairs and Renewals— Distribution Expenses | Lines and Conduits | Meters and Transformers | Street Lamps | Revenue from Electric Sales | Distribution Expense Per Kw.-hr. Sold | Distribution Expense Per Dollar of Electric Revenue |
|---|---|---|---|---|---|---|---|---|
| A | 27,458,701 | $125,880 | $35,782 | $4,722 | $8,036 | $1,207,301 | 0.364c. | 10.3c. |
| B | 24,730,766 | 177,962 | 18,362 | 10,729 | 8,084 | 1,295,160 | 0.72c | 13.7c. |
| C | 39,044,709 | 120,169 | 22,424 | 6,176 | 12,852 | 1,306,671 | 0.307c. | 9.2c. |
| D | 23,613,941 | 122,772 | 46,884 | 2,752 | 7,034 | 1,180,407 | 0.52c. | 10.4c. |
| E | 69,507,076 | 103,269 | 36,958 | 4,288 | 15,932 | 1,953,056 | 0.148c. | 9.4c. |
| F | 60,015,648 | 231,753 | 110,915 | 13,909 | 30,319 | 2,333,811 | 0.385c. | 9.9c. |

dollar of plant repairs is used by that side of the house. In some cases it costs more to repair the station building during the year than has to be spent on electrical upkeep within its walls. Such figures are not a reflection on the design of steam machinery and apparatus in general, but they do reflect a certain intrinsic superiority arising out of electrical methods of working. The annual repairs to plant per kilovolt-ampere of rating ranged from about $1.08 to $2.29, certainly a less wide variation than might have been expected from a group of stations, all of which are separately managed with the exception of stations A and D.

Maintenance costs in connection with distribution are shown in Table IV for these stations. Here again it is apparent that the high fuel costs which such companies have been forced to meet have profoundly affected their entire gamut of operations from the coal pile to the consumer's meter. Total distribution expenses ranged broadly in these plants between $100,000 and $230,000, and the per kilowatt-hour sold ranged from about 1.5 mills to 7 mills. Maintenance items, however, still represent only a moderate proportion of distribution expenses, with one or two exceptions, but a sufficient proportion to justify a sharp watch on this class of costs. Roughly, from 9 cents to 13 cents per dollar of electrical revenue goes into distribution expense in these companies, and half or a third as much can be put into maintenance without serious effect on the relative showing of upkeep and earnings.

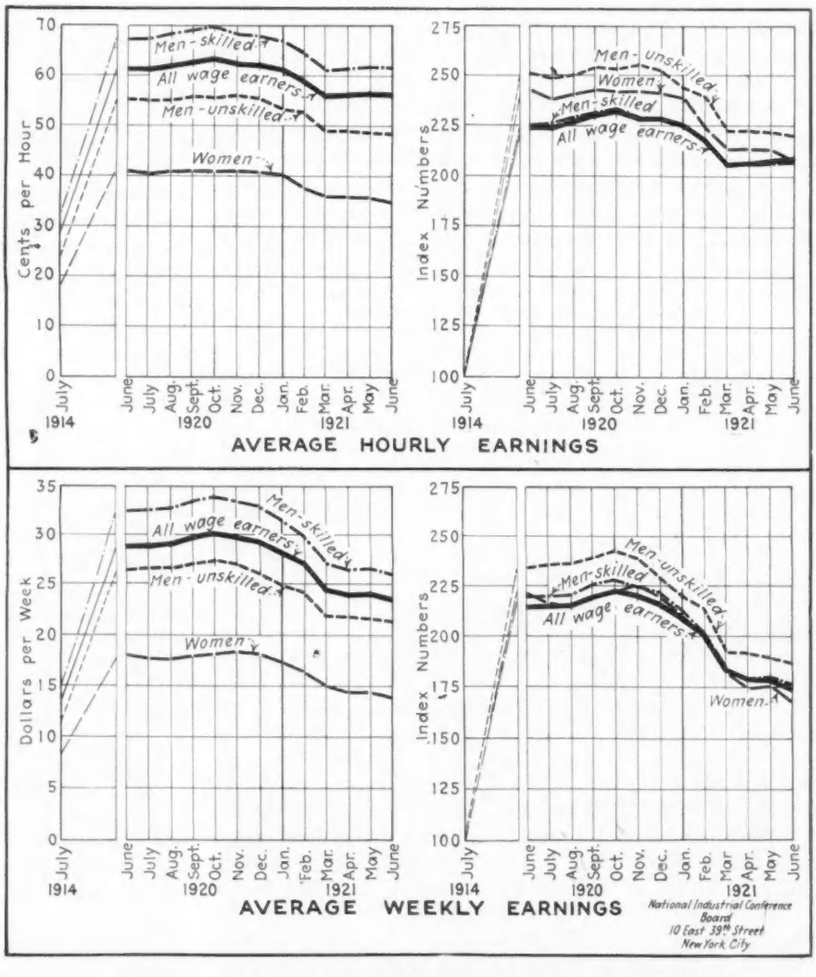
From the moderate size of upkeep expenses compared with operating and distribution costs it appears that some increase in these might in many cases be permissible if the returns are well indicated. In other words, more money can and should in many cases be expended on inspection—for what might be called "preventive maintenance," forestalling troubles before they arise. Nothing like the neglect of inspection often encountered in industrial power applications, or in some industrial power plants, can be found in central stations of the type listed here. Central-station managers and engineers can afford to take a much more liberal view of inspection costs if by their increase a more scientific system of trouble prevention is effected. To the thoughtful investigator of central-station economics this is a most attractive field of attack.

## Wages in Electrical Industry

A COMPREHENSIVE investigation of wage changes in twenty-three basic industries of the country for the period from July, 1914, to July, 1921, has been completed by the National Industrial Conference Board, and the results are described and illustrated by charts and tables in its Research Report No. 45. The study covers data from 4,398 establishments, employing approximately 1,250,000 workers, and is believed to be the only continuous record available of comparable data as to wage changes occurring during the entire period since July, 1914.

For the electrical apparatus industry the report covers 107 plants in nineteen states, employing in October, 1920, 88,000 wage earners, or more than 35 per cent of the workers engaged in the industry.

Composite hourly earnings of all wage earners in this industry showed an increase of 132 per cent from July, 1914, to October, 1920. The decline from October, 1920, to July, 1921, was 11 per cent, and at that time the increase over July, 1914, was 106 per cent. Composite weekly earnings of all wage earners increased 123 per




TREND OF WAGES IN THE ELECTRICAL INDUSTRY, 1914-1921

cent from July, 1914, to October, 1920, and from the latter period through June, 1921, declined 22 per cent, showing a net increase in the middle of 1921 of 74 per cent over July, 1914.

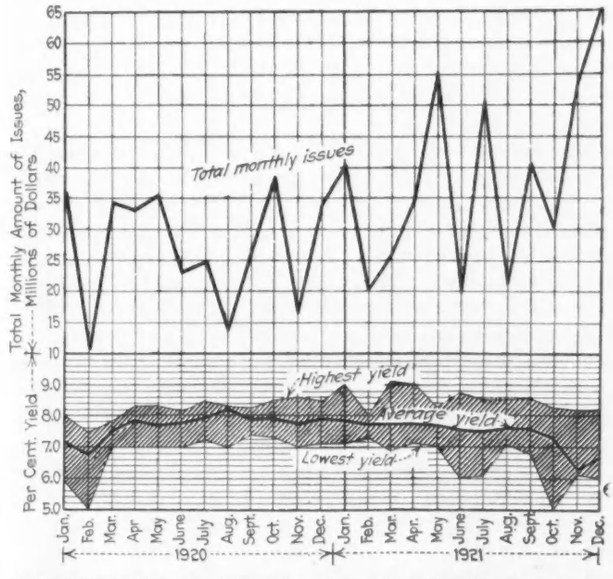
In the electrical generation and distribution industry data were received from 236 plants in thirty-seven states and employing in December, 1920, 16,268 wage earners.

Composite hourly earnings of all wage earners in this branch of the industry increased 105 per cent from July, 1914, to November, 1920, and from the latter period through June, 1921, declined 4.4 per cent, leaving a net increase of 96 per cent over July, 1914. Composite weekly earnings of all wage earners in the electrical generation and distribution industry increased 89 per cent from July, 1914, to August, 1920, and from the latter period through June, 1921, declined 4.2 per cent, leaving a net increase of 81 per cent over July, 1914. The report notes that no proper comparison can be made between wage and employment conditions in electric light and power plants and in those of electrical manufacturing establishments, as the wage situation in public service plants is largely controlled by legal provisions and local ordinances and is but little affected by the general economic condition.

# Security Yields Show Material Decrease During 1921

### New Electric Light and Power Issues in the Last Year Total $459,066,643—Large Growth of Series Issues Is a Feature

THE year 1921 proved to be a remarkable one in investment market history because there occurred during that period a decided change for the better in the prices for all classes of bonds. Although the advance was a gradual movement and not a sudden development, there was from the beginning of the year a marked tendency toward better credit conditions to which bond prices readily responded. As the year progressed the reaction became more pronounced, and in the final quarter bonds were marketed on unusually advantageous terms.


Total Monthly Amount of Issues, Millions of Dollars
Per Cent. Yield
Total monthly issues
Highest yield
Average yield
Lowest yield
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1920
1921

MONTHLY ISSUES OF ELECTRIC LIGHT AND POWER SECURITIES, AND THE GRADUAL DECREASE IN YIELD

ELECTRIC LIGHT AND POWER SECURITY ISSUES IN 1921

| | Amount of Issue |
|---|---|
| **Mortgage Bonds** (average yield 7.35 per cent) | |
| 6 issues at 5 per cent | $5,060,000 |
| 27 issues at 6 per cent | 104,154,000 |
| 2 issues at 6½ per cent | 30,572,000 |
| 27 issues at 7 per cent | 98,314,000 |
| 17 issues at 7½ per cent | 50,937,000 |
| 12 issues at 8 per cent | 17,156,000 |
| 91 issues | $306,193,000 |
| **Debentures** (average yield 7.99 per cent) | |
| 2 issues at 7 per cent | $8,600,000 |
| 2 issues at 7½ per cent | 12,000,000 |
| 1 issue at 9 per cent | 436,000 |
| 5 issues | $21,036,000 |
| **Notes** (average yield 7.44 per cent) | |
| 1 issue at 5 per cent | $1,750,000 |
| 1 issue at 6 per cent | 600,000 |
| 1 issue at 6½ per cent | 2,000,000 |
| 8 issues at 7 per cent | 41,700,000 |
| 2 issues at 7½ per cent | 1,869,000 |
| 10 issues at 8 per cent | 15,700,000 |
| 23 issues | $63,619,000 |
| **Preferred Stock** (cumulative)—(average yield 7.94 per cent) | |
| 9 issues at 8 per cent | $25,313,000 |
| 3 issues at 6 per cent | 7,080,275 |
| 1 issue at 7 per cent | 1,000,000 |
| 13 issues | $33,393,275 |
| **Preferred Stock** (non-cumulative)—(average yield 7.76 per cent) | |
| 2 issues at 8 per cent | 9,000,000 |
| 1 issue at 7 per cent | 88,200 |
| 1 issue at 6 per cent | 1,200,000 |
| 1 issue | 547,863 |
| 5 issues | $10,836,063 |
| **Common Stock** | |
| 10 issues | 21,837,605 |
| Total of all issues of year | $456,914,943 |

Electric light and power financing was extremely active during the past year. The total amount of stocks and bonds of this class offered investors was $456,914,943 as compared with $315,990,740 for the year 1920. The year started with January's showing a total of $40,584,000, an increase of more than $2,000,000 over October, 1920, the banner month of that year. In February there was a slump, but a quick recovery followed, and from that month until June there was a steady upward trend in the amount of financing. In June the amazingly low figure of $19,939,263 was reached, representing a decrease of more than $35,000,000 under the high total reached in May. June, 1920, however, also showed a correspondingly large drop from the total of the preceding month. After August the record was one of almost unbroken advance, culminating in December in the unprecedented total of $66,300,400.

The accompanying tabulation shows the prominent position occupied by the sale of electric light company stocks during the year. New stock issues were especially numerous during the latter part of the year when the decreasing bond yields rendered dividend paying stocks more attractive. The new stock issues totaled $66,066,943, or 14.5 per cent of the total electric light and power security issues in 1921.

The accompanying curve reveals the fluctuations in the per cent yield from month to month and indicates the decided drop which has taken place in security yields. During the first five months of the year the average yield ranged from 7.85 to 7.71, but in June the rate of return dropped to 7.54 and in July to 7.51. During August and September there was no appreciable change in the yields, but in October offerings yielded on an average only 7.33 to investors. The lowest average yield during the year was reached in November (6.33), and December brought but a slight increase.

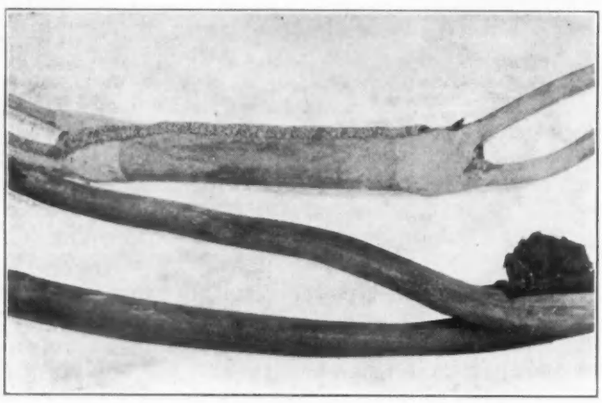
# Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

## How Insects Attack Cables in Canal Zone

*To the Editors of the* ELECTRICAL WORLD:

Insects or termites have been causing considerable trouble with lead cables in the Canal Zone by cutting through the lead and into the insulation, where they



TUNNEL BUILT ON CABLE SHEATH BY INSECTS WHICH CUT THROUGH THE LEAD

afterward make their homes. A close inspection has shown that when anything comes in contact with the claws with which these small invaders work a white, milky substance issues from their mouths. It is thought by some that this substance dissolves the lead. The accompanying illustration shows a built-up tunnel formed on top of a cable joint. A. R. LANE.

Pedro Miguel, C. Z., Panama.

## School for Electric Metermen

*To the Editors of the* ELECTRICAL WORLD:

On page 1244 of the Dec. 17 ELECTRICAL WORLD I observe announcements that Iowa and Wisconsin universities will give meter courses in January. Our first school for electric metermen, which was started last April, proved to be much more popular than we had anticipated and was attended by about sixty representatives from light and power utilities in the state as well as by representatives of the meter manufacturers. As a result of this school it was requested by those present that this work be continued in a course of not less than one week's duration to be held next March. This we are planning to do.

We have found a very ready response on the part of the utilities and manufacturers, the latter furnishing large quantities of latest design instruments for test and demonstration, and the former furnishing testing standards and resistance loads which were calibrated against our standards in the relatively large classes on meter testing.

It is expected that the question of current and potential transformers will probably be more extensively studied at the forthcoming school.

C. FRANCIS HARDING,
Head of the School of Electrical Engineering.
Purdue University, Lafayette, Ind.

## Ease of Using Illumination Charts

*To the Editors of the* ELECTRICAL WORLD:

I have read with considerable interest R. H. Cook's contribution to the ELECTRICAL WORLD in the issue of Oct. 29, 1921, page 876, in which he presented a "Simple Chart for Illumination Calculations." Before commenting on this chart it should be noted that the "vertical distance from lamp to working plane" should be $Y$ on the diagram instead of $X$, the latter marking being obviously a mechanical error.

Mr. Cook states (in referring to my article in the June 19, 1920, issue of the ELECTRICAL WORLD, page 1,423): "I believe that the curves in the form presented . . . are very unwieldy and hard to handle. The eye can more readily follow a system of straight lines than a system of curves and straight lines. I have attempted to produce a chart correcting the conditions just mentioned," etc.

The writer takes exception to Mr. Cook's statement that the chart as presented by me is "very unwieldy and hard to handle." The intersection of abscissas and ordinates on my chart locates at the same point the value of the multiplying constant $K$ and the angle $\theta$ which is used in obtaining the candlepower $I$ from the light distribution curve. These values of $K$ and $I$ can readily be jotted down in tabular form, as shown in Table I below. That completes the use of the chart. Mr. Cook is undoubtedly correct, however, in stating that the eye can more readily follow a system of straight lines; but the extra tax on the eye seems to be insignificant in comparison with the extra use of the slide rule, or arithmetic, and the necessity for and use of a cosine table, in order to produce the same result with Mr. Cook's chart.

The purpose of the writer's chart is clearly summed up in the last paragraph of his article, which is: "It is hoped that this chart will supply . . . a means of arriving easily, quickly and with reasonable accuracy at foot-candle values from the distribution curves of lighting units." The foot-candle values here referred to were those which are perpendicular to the horizontal plane.

The purpose of Mr. Cook's chart, outside of presenting a system of straight lines which can be easily read, is not obvious. In fact, his chart merely determines the third side of a right-angle triangle when any two sides are given, and also obtains the square of the hypothenuse. The angle $\theta$ has been lost sight of in the simplicity of straight lines, so that any practical use to which the chart may be put requires the further use of a table of natural sines or cosines. In explana-

TABLE I—SOLUTION BY I. W. GROSS' CHART ("Electrical World," June 19, 1920, page 1423). $H = 10$ ft.

| D | K | $\theta$ | I | F |
|---|---|---|---|---|
| Ft. | Constant | Deg. | Cp. | Ft.-candles |
| 0 | 0.098 | 0 | 540 | 5.29 |
| 5 | 0.072 | 27 | 620 | 4.37 |
| 10 | 0.037 | 45 | 570 | 2.11 |
| 14 | 0.0021 | 54 | 520 | 1.090 |
| 15 | 0.0019 | 57 | 500 | 0.950 |
| 20 | 0.0009 | 63 | 470 | 0.423 |

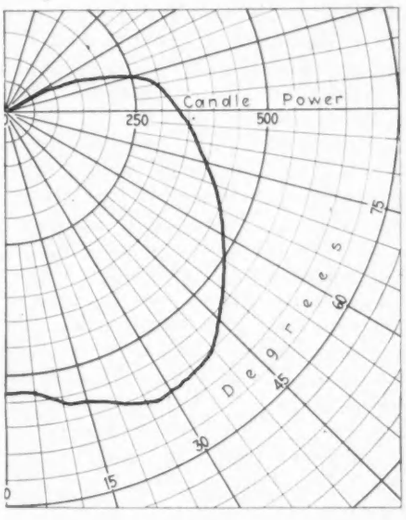
TABLE II—SOLUTION BY R. H. COOK'S CHART ("Electrical World," Oct. 29, 1921, page 876).

| X | Z | $Z^2$ | Y/Z, | $\theta$ | I | $E_1$ |
|---|---|---|---|---|---|---|
| Ft. | Ft. | $Ft.^2$ | Ratio | Deg. | Cp. | Ft.-candles |
| 0 | 10 | 100 | 1.0 | 0. | 540. | 5.40 |
| 5 | Indeterminate on chart. | | | | | |
| 10 | 14.1 | 200 | 0.71 | 44.8 | 580. | 2.05 |
| 14 | 17.2 | 295 | 0.582 | 54.4 | 515. | 1.013 |
| 15 | Indeterminate on chart. | | | | | |
| 20 | Indeterminate on chart. | | | | | |

tion take Mr. Cook's example under his chart, where he has determined $I = 4{,}420$ cp. If it is desired to plot this value on a polar curve of the lighting unit in question, it is necessary to know $\theta$, and to know $\theta$ a natural function of $\theta$ must be determined and $\theta$ looked up in a table. Neither my chart (ELECTRICAL WORLD, June 19, 1920) nor the standard tables, such as are found in the "Railway Electrical Engineer's Handbook," require the use of other equipment than the polar curve of the light source.

Mr. Cook's chart, as presented, has only a limited range for $X$, that is, from 7 ft. to 14 ft. His contention that "it can be used for greater values by multiplying each variable ($X$, $Y$ or $Z$) by a common number . . . which will result in an increase in range of the chart of two, three and four times" is misleading. For example, taking $Y$ as 10 ft., the $X$ range is from 7 ft. to 14 ft., and you cannot multiply $X$ by any number other than 1 and have the chart values hold true, provided, as in the practical case, $Y$ is to be held constant in a given problem.

As a typical illustration of the working of Mr. Cook's chart and my own I present below the solution of the following problem: Determine the foot-candle illumination perpendicular to a horizontal plane, the source of light being 10 ft. above the plane and having the polar curve of Fig. 3. Aside from tabulating the horizontal distance $D$ and $X$ in the tables herewith, Mr. Cook's chart requires six tabulated columns against four for my chart. His chart requires two slide-rule operations against one for mine. His requires the use of a cosine table; mine does not. Further, in Mr. Cook's chart $E_1$ cannot be determined for three of the points selected for $X$ above, while with my chart an infinite number of $E$ values can be determined from $D = 0$ to $D = 20$, and in fact $E$ can be determined for any value of $D$ up to 250 ft., which in this case is far outside any desired value.




POLAR CURVE OF LIGHT SOURCE CONSIDERED

The above simple example shows Mr. Cook's chart to be considerably more cumbersome than the writer's chart, besides requiring the use of information not given, namely, the table of cosines. I. W. GROSS.

New York, N. Y.

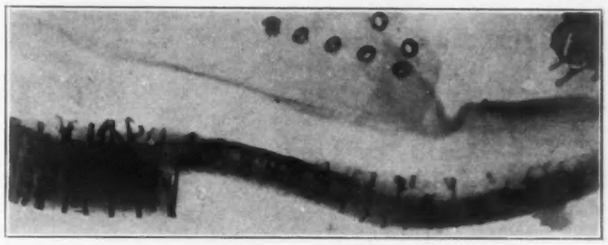
## Nails in Soles of Electrical Workers' Shoes Are Suicidal

*To the Editors of the* ELECTRICAL WORLD:

The hidden dangers of shoes having nails in the soles and heels are clearly revealed through the aid of the X-ray. From such photographs it is seen that it is suicidal for electrical workers to wear shoes of this type. All shoes worn by men who are exposed to electrical hazards should have wooden pegs instead of metal nails.

No one who thought for a moment would enter an electric plant carrying a steel fishing rod over his shoulder, and yet that is exactly what a man did, and for his thoughtlessness he nearly paid his life. It was only through the prompt application of the prone-pressure method of resuscitation that his life was finally saved.

However, the long steel fishing rod is no better conductor of electric current than a wire that is concealed in a derby hat or a wire nail that is hidden in a shoe. Altogether too little attention is given by electrical workers to the highly important matter of dress. Even



X-RAY OF SHOE WORN BY ELECTRICAL WORKER SEVERELY INJURED.

a finger ring or a watch chain has been known to prove deadly. In like manner there is hidden danger in metal buttons on clothing and in eyeglasses with metal or inflammable frames. Often danger may lurk in the metal button that is slipped into the lapel of a man's coat.

Most men are on the lookout for danger when they enter an electric plant, but many of them may not realize that they are carrying right with them into the plant the metal or inflammable parts that may serve to drive a deadly current through their bodies.

Chicago, Ill. GEORGE F. PAUL.

## Long Spans for Rural Lines

*To the Editors of the* ELECTRICAL WORLD:

The article on "Long Spans Proposed for Rural Lines," published in the Dec. 10 issue of the ELECTRICAL WORLD, is very interesting to me, particularly in view of the fact that we have been constructing and operating rural lines having long spans for the past six or seven years with excellent results. Aside from tree troubles, which are not affected by length of span, the most prolific source of trouble is the failure of insulators due to mechanical injury or poor design. Increasing the length of span eliminates a large percentage of insulators and so minimizes insulator troubles.

Referring to the specifications given in the article, why is it considered advisable to use weatherproof insulation, particularly in view of the decreased factor of safety, the doubtful benefits and the trend toward higher voltages for rural lines?

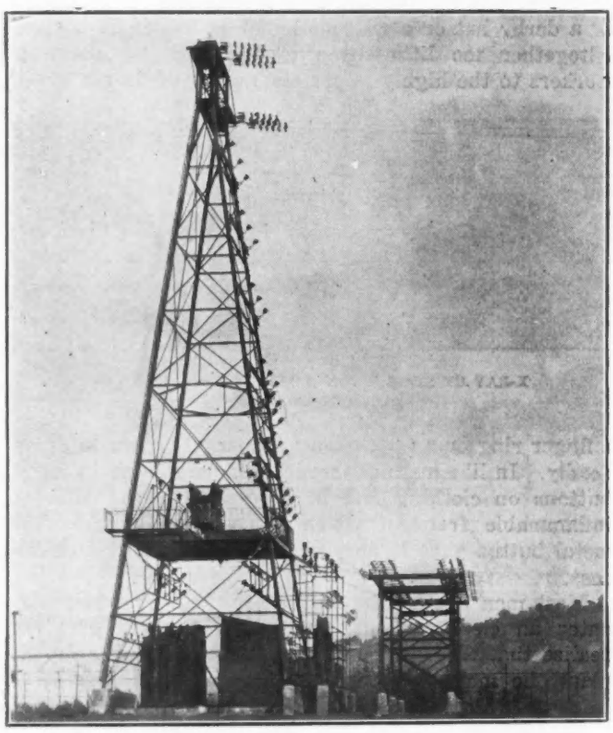
Utah Power & Light Co., Salt Lake City, Utah — PAUL P. ASHWORTH, Distribution Engineer.

# Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

## Transmission Tower Serves Also as Substation Frame

A 125-FT. crossing tower turned into an outdoor substation is the unusual feature of the High Bridge substation of the Northern States Power Company at St. Paul. The tower shown in the illustration is one support of a 1,700-ft. span over the Mississippi River, and the substation of two transformer banks



RIVER CROSSING TOWER UTILIZED AS A SUBSTATION BY THE NORTHERN STATES POWER COMPANY

of 3,000 kva. rating each steps the voltage from 63 kv. to 13.2 kv. for the rural and suburban service in the St Paul territory and also connects with the 13.2-kv. tie-line circuits between St. Paul and Minneapolis. The crossing conductor is made up of a stranded-steel cable core around which is built up copper equivalent to No. 2/0. The strain under maximum load conditions is 17,000 lb. per conductor. The two transformer banks are protected on the high-tension side by 70-kv. outdoor, automatic, solenoid-operated oil circuit breakers which are controlled from the steam station 8,000 ft. away. The 13.2-kv. switching equipment is placed in steel switch houses, one being provided for each bank of transformers. These houses are placed within the uprights of the tower. The 13.2-kv. bus construction is suspended underneath the platform on which the 70-kv. oil circuit breakers are installed. The 13.2-kv. transmission lines terminate on the steel structure shown at the right of the illustration, from which they go through open air switches to the 13.2-kv. bus. Lightning arresters are placed between the 13.2-kv. rack and the foot of the tower. The entire construction is very compact and utilizes the steel tower to the utmost.

FIELD EDITOR ELECTRICAL WORLD.

Chicago, Ill.

## Melting Sleet by Short-Circuiting Transmission Lines

VERY successful elimination of sleet from certain transmission circuits of the New England Power Company was practiced during the recent severe storm by applying reduced voltage to short-circuited conductors. A detailed account of the manner in which the job was handled was recently sent the New England Bureau of Public Service Information by A. E. Pope, assistant general manager of the company, and through the courtesy of the bureau the following condensed summary of the events described is presented:

The lines in question were two No. 1 copper three-phase circuits about 8.3 miles long, extending from a station in the lower Deerfield Valley over the Hoosac range to the North Adams substation. The greater part of the right-of-way is at elevations of 2,000 ft. to 2,500 ft., and on two former occasions sleet coverings measuring 3 in. to 4.5 in. diameter have been experienced. The circuits are parallel, and previous tests showed about 350 amp. necessary to melt sleet. The two lines were alternately short-circuited at the North Adams substation, about 6,000 volts being necessary to furnish the requisite current for melting. To obtain this voltage the company used two transformers of its regular equipment, consisting of 4,000-kva., three-phase, 69,000-volt Y/2,300-volt delta units. The special voltage required was secured by connecting the high-tension side of the transformers in multiple, opening one of the low-tension deltas, and connecting the individual coils of this delta in series with the regular 2,300-volt delta of the other bank, giving an extended delta connection of virtually 6,000 volts between wires. The entire outfit was operated from an independent machine.

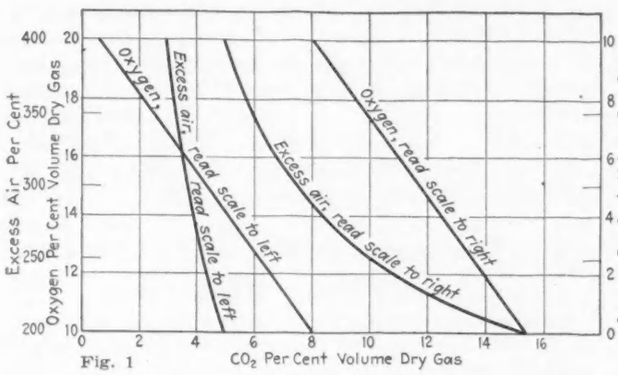
From two to two and a half hours was required to thaw the circuit after application of 340 amp. to 350 amp., and about one and a half hours was consumed in making the necessary arrangements to withdraw one line from service, short-circuit it, and make the thawing apparatus connections, the other circuit carrying the load meanwhile. Sleet formed so rapidly that alternate periods of thawing were required for about fifteen hours. During all this period customers' service on this section of the system was continuously fed by one or the other of the two circuits. Considerable time was lost in changing over, as this was the first trial of the thawing outfit on the transmission lines, and the operators

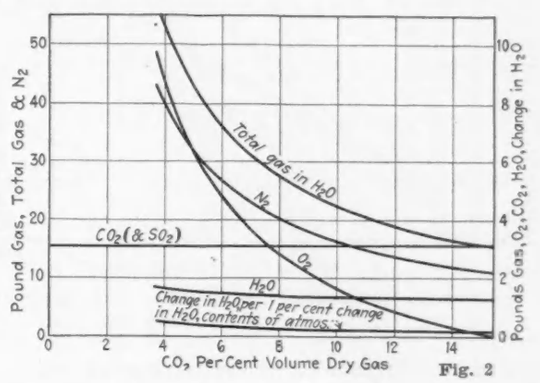
attempted to follow the usual rules for tagging, etc. In the future a similar condition will be treated as an emergency, and this should cut down the time for changing over to between fifteen and thirty minutes. The company is now studying its entire transmission system to determine how far this method can be applied in line protection throughout its territory.

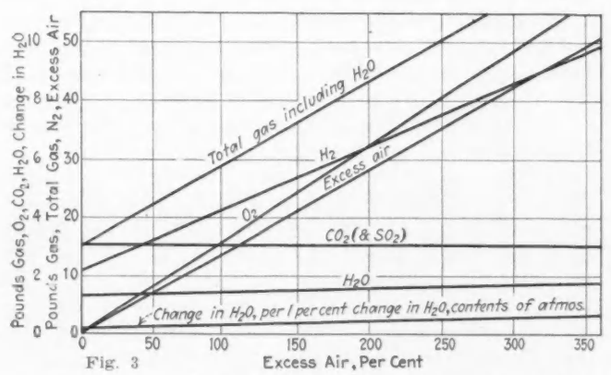
## Determining Heat Content of Gases from Oil-Fired Boilers

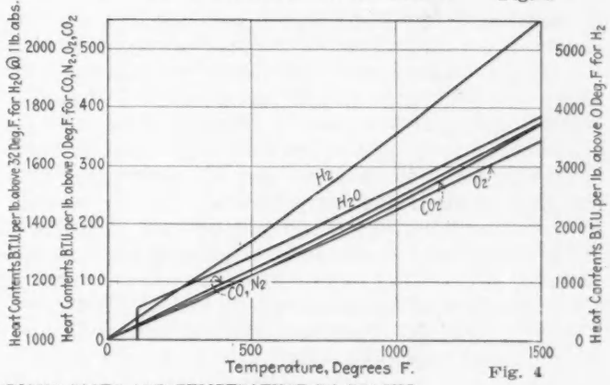
IN THE operation of oil-fired boilers a large proportion of the heat lost is that combined in the gases discharged to the stack. All operators know in a general way of the effect of excess air and temperature on this loss, and the determination of its amount is not difficult —the necessary formulas being given in many handbooks—but calculations are rather long and tedious for a complete solution. For convenience, these data have been reduced to a series of curves by means of which the properties of these flue gases can be determined quite easily. The first three sets of curves are based on the analyses of fuel oil and atmosphere given in the accompanying table. The oil analysis assumed is an average figure which is close enough for routine work with any of the fuel oils now in common use. In the atmosphere analysis a departure from the usual practice has been made by including a small amount of water vapor. As water vapor is always present in the atmosphere and as its specific heat is approximately twice that of other gases of combustion, its effect on the heat content is relatively large. Therefore the actual water-vapor content of atmosphere or gases of combustion should be considered in combustion problems. One per cent has been selected as an average water-vapor content of the atmosphere, representing a relative humidity of 65 per cent at 70 deg. Fahr.

In Fig. 1 the oxygen curve is useful principally for checking the consistency of the Orsat analyses. The excess-air curve is used to determine the amount of excess air corresponding to various $CO_2$ determinations. No allowance has been made for the presence of CO, as the gases from a properly controlled oil-fired boiler will never contain any CO. Fig. 3 is similar, but on an excess-air basis.


Excess Air Per Cent
Oxygen Per Cent Volume Dry Gas
Oxygen
Excess air, read scale to left
Oxygen, read scale to right
Excess air, read scale to right
CO₂ Per Cent Volume Dry Gas
Fig. 1


Pound Gas, Total Gas & N₂
Excess Air Per Cent
Pounds Gas, O₂, CO₂, H₂O, Change in H₂O
Total gas in H₂O
N₂
CO₂(& SO₂)
O₂
H₂O
Change in H₂O per 1 per cent change in H₂O contents of atmos.
CO₂ Per Cent Volume Dry Gas
Fig. 2


Pounds Gas, O₂, CO₂, H₂O, Change in H₂O
Pounds Gas, Total Gas, N₂, Excess Air
Total gas including H₂O
H₂
Excess air
O₂
CO₂(& SO₂)
H₂O
Change in H₂O, per 1 per cent change in H₂O, contents of atmos.
Excess Air, Per Cent
Fig. 3


Heat Contents B.T.U. per lb. above 32 Deg. F. for H₂O @ 1 lb. abs.
Heat Contents B.T.U. per lb. above 0 Deg. F. for CO, N₂, O₂, CO₂
Heat Contents B.T.U. per lb. above 0 Deg. F. for H₂
H₂
H₂O
CO₂
O₂
CO, N₂
Temperature, Degrees F.
Fig. 4

FIGS. 1, 2, 3 AND 4—RELATIONS BETWEEN VARIOUS GASES AND TEMPERATURE IN STACKS

Fig. 1—Relation of $CO_2$ to oxygen and excess air. Fig. 2—Weights of products of combustion of 1 lb. of oil for various percentages of $CO_2$. Fig. 3—Weights of products of combustion of 1 lb. of oil for various percentages of excess air. Fig. 4—Heat content of products of combustion for temperatures below 1,500 deg. Fahr.

Fig. 2 gives the weight of each constituent of the flue gas in pounds of gas per pound of oil for various percentages of $CO_2$. The change in the amount of water vapor for each 1 per cent change in the amount of water vapor in the atmosphere is also shown. This water-vapor correction may be either added or subtracted as the case requires. If oil is atomized with steam, the amount of this steam should be added to amount of water vapor found from curves.

One example will be sufficient to illustrate the use of these curves: To find the heat content of the gas resulting from the combustion of 1 lb. of oil under following conditions: $CO_2$, 13 per cent; temperature, 500 deg. Fahr.; vapor content of atmosphere, 1.5 per cent; steam used for atomizing per pound of oil, 0.2 lb. From Fig. 1 the excess air equals 17 per cent; from Fig. 2

ANALYSIS OF OIL AND ATMOSPHERE IN PERCENTAGES BY WEIGHT

| Fuel Oil | | Atmosphere | |
|---|---|---|---|
| Carbon | 84.0 | Nitrogen | 76.08 |
| Hydrogen | 12.7 | Oxygen | 22.92 |
| Oxygen | 1.2 | Water vapor | 1.00 |
| Sulphur | 0.4 | Total | 100.00 |
| Nitrogen | 1.7 | | |
| Total | 100.0 | | |

| Constituent | Weight, Lb. | Heat Content per Pound Gas, B.t.u. | Total Heat Content, B.t.u. |
|---|---|---|---|
| $CO_2$ | 3.09 | 110 | 340 |
| $N_2$ | 12.6 | 120 | 1,512 |
| $O_2$ | 0.55 | 110 | 60 |
| $H_2O$ from curve | 1.30 | | |
| (0.5 × 0.18) | 0.09 | | |
| Atomizing steam | 0.20 | 1.59 | 1,285 | 2,043 |
| Total | 17.83 | | 3,955 |

for 13 per cent $CO_2$ and from Fig. 4 for 500 deg. Fahr. the following are taken:

The difference in total heat content of gases at any two points will be the amount of heat given up by gases between those two points. The weight of air ad-

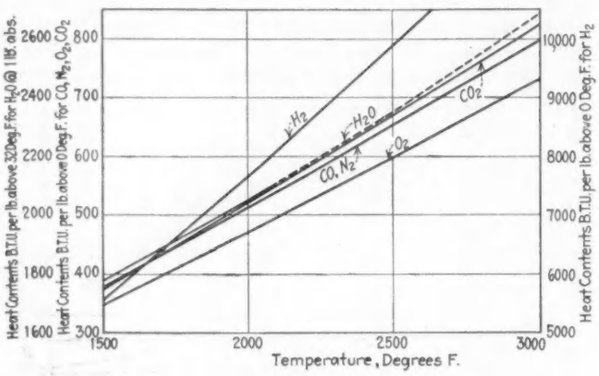



FIG. 5—HEAT CONTENT OF PRODUCTS OF COMBUSTION FOR TEMPERATURES ABOVE 1,500 DEG. FAHR.

mitted to a furnace for any given gas analysis will be the total gas from Figs. 2 or 3 less 1 lb. for oil. The weight of dry air will be the weight of air, as above, less the weight of the water vapor, for which an amount shown by the "change of $H_2O$" curves may be used. The heat content of dry air may be found closely enough for ordinary work by taking the heat content of nitrogen from Fig. 4 and the heat content of water vapor from the $H_2O$ curve if the temperature is above 101 deg. Fahr.; otherwise steam tables may be used. The use of these curves will give results commensurate with the accuracy of the $CO_2$ and temperature determinations obtained in operation practice.

N. G. HARDY,
Chief Mechanical and Electrical Engineer.
The Arizona Copper Company,
Clifton, Ariz.

## Adapting Electric Heat for Baking Japan on Automobile Fenders

USING electric heat in baking the japan on automobile fenders and running-board curtains, the Moon Motor Car Company has been able to produce 11.1 lb. of finished product per kilowatt-hour. The oven used for baking is a standard design and is arranged for overhead, semi-continuous conveyor operation. This conveyor runs through the top of the oven, and the parts to be baked are suspended from it by metal hooks. The semi-continuous operation allows one load to be removed from the conveyor, while another is in the oven baking and still another is hanging on the other end of the conveyor so that the excess japan can drip off before the material enters the oven.

The inside dimensions of this oven are: Length, 16 ft.; width, 9½ ft.; and height, 8 ft. All the walls, both top and bottom, are covered with 4 in. of insulating material. The nickel-chromium heating elements, which have a rating of 144 kw., are oversize for this installation and are mounted on the lower side walls and in the center of the floor. The electrical operation of this oven is automatic, being arranged with a safety door switch. A 5-hp. motor runs the conveyor and a ½-hp. motor operates the ventilating system, consisting of ducts running from the top of the oven down the sides, with the intakes at the top and along the bottom floor.

A maximum of seven bakes in a nine-hour day is obtained, since one hour and thirty-six minutes is required to bring the oven up to the temperature of 400 deg. after the first load is placed within the oven in the morning. From this time on, one hour to one hour and eight minutes is necessary for each succeeding bake. The average weight of each load is about 1,400 lb., consisting of forty-eight front fenders, thirty-four rear fenders or sixty running-board curtains; but since some of these fenders are very bulky the actual weight is often reduced. Since each part must receive two coats of japan before assembly this electric oven furnishes a steady production, a better control and an evenness of baking.

JAMES W. CARPENTER,
Industrial Heating Engineer.
Union Electric Light & Power Company,
St. Louis, Mo.

## Two Governors on Hydraulic Unit Give Advantageous Regulation

A HIGH degree of flexibility and a flat efficiency curve under varying load conditions were attained in the hydraulic unit recently installed in the Newhalem Creek hydro-electric plant, where two Pelton wheels, each having its own governor, drive one generator. This plant supplies power for construction purposes on the Skagit project, which is being carried out by the city of Seattle about 100 miles north of that city on the Skagit River.

In selecting the hydraulic unit best suited to the conditions at this plant both impulse and reaction types were considered. The manufacturer would guarantee 84 per cent efficiency on a reaction turbine and only 79 per cent on an impulse wheel. However, the impulse type was chosen because it was believed to give greater assurance of continuous service, which was important as there was to be only one unit in the installation and no other plants on the system.

Features of the impulse type which were considered of particular advantage in this plant were (1) the possibility of dividing the prime mover into two parts, (2) the elimination of wear on gates, and (3) eliminating the thrust problem.

The plant has a single 3,000-hp. generator driven by two waterwheels, one on each end of the extended main generator shaft. The runners are of the impulse type and operate under a head of 510 ft. at 450 r.p.m. The desired degree of control was secured by the use of two independent governors, one for each side of the unit. One of these is adjusted for a narrow speed range, while the other is set to take care of the heavy load swings. Each governor has its own oil pressure pump, pressure tank and sump, the governor head and pump being independently belt-driven from the waterwheel shaft.

The subdivision of the prime mover into two parts makes it possible to shut down either half separately, thus operating the electrical unit at half load with hydraulic efficiency as good as for full load. This is

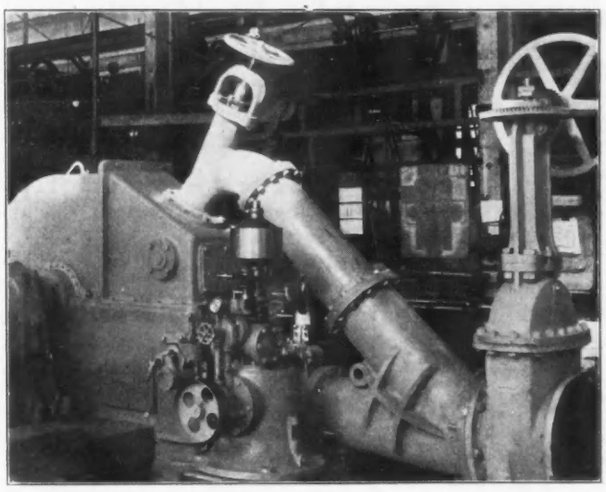
expected to be a great advantage in times of light load requirements or limited water supply. It is also possible to make adjustments or replacements of parts on either side of the unit while the other half is in service, thus providing more than the usual insurance against complete shut-down and interruption of service. With two governors on the unit, either one can be taken out of service and adjusted or repaired without decreasing the output of the plant, all load fluctuations up to 50 per cent of capacity being taken care of meantime by the remaining governor.

By a sensitive adjustment on one of the governors and a wider speed range on the other, compensations for all small load fluctuations are made by the first governor, while large changes in demand are handled by the second. Thus a closer and more sensitive speed regulation is obtained than would be feasible if the entire unit were being controlled by a single governor, because any tendency toward hunting which might occur in a single governor with an over-sensitive adjustment is prevented by the action of the second and more sluggish governor.

This arrangement makes it possible to operate a single-unit plant on a basis similar to that of a well-balanced power system in which the sensitive governing is taken care of on one unit while other units are adjusted to handle only the heavy load variations.

Speed regulation in the Newhalem plant could have been effected (1) by direct governor control of needles in the nozzles or (2) by use of a diverting jet of either deflector or sleeve type. The needle type of control would have made it possible to economize on the use of water, but as no provision for storage was made in this development there was no advantage in saving water. A sleeve-type deflector was therefore selected, designed to avoid any loss of efficiency in the jet and to give full protection from pressure rises in the penstock.

As this unit is rarely if ever to be operated at less



ARRANGEMENT OF ONE PELTON WHEEL AND GOVERNOR OF TWIN SET DRIVING ONE 3,000-HP. GENERATOR

than 50 per cent of its rating, it was considered permissible to omit the hand-operated needle on the lower nozzle of each runner, thus avoiding the losses in efficiency which such needles would have involved. The upper nozzles, however, are provided with hand-operated needles so either runner can be cut down to half load without disturbing the governor setting.

The hydraulic equipment at the Newhalem plant was supplied by the Pelton Water Wheel Company.

FIELD EDITOR ELECTRICAL WORLD.
San Francisco, Cal.

## Distribution-Transformer Tests with Ammeter Are Satisfactory

AS A VERY satisfactory method of testing loads on distribution transformers the Portland (Ore.) Railway, Light & Power Company has for some time been employing an ammeter and split-type current transformer and making only momentary readings. These

DAILY TRANSFORMER REPORT

No. 36

Date 1-26-21

| NUMBER | LOCATION | TRANSFORMER | LOAD |
|---|---|---|---|
| 619 D (5KW) | E. 26th bet. Fremont & Failing Sts. 6:40 P.M., Fuses O.K. | N 3 6 — 14 — S 10 23 28 | 67% 138% |
| 558 D (5KW) | Klickitat St. Bet. E. 26 & E. 27th Sts. 6:55 P.M., Fuses O.K. | W 14 20 — 17 23 — E 5 3 | 82% 120% |
| 87 H (7½KW) | Siskiyou St. bet E. 14 & E. 15th Sts. 7:05 P.M., Fuses O.K. | S 20 5 — 27 18 — N 7 13 | 87% 55% |
| 287 C (10KW) | Stanton St. bet E. 21 & E. 22nd Sts. 7:20 P.M., Fuses O.K. | W 12 — 30 30 — E 29 16 | 69% 69% |

FORM TO SIMPLIFY DISTRIBUTION TRANSFORMER TESTS

readings are made periodically on the outside (220-volt) legs of the three-wire, 110/220-volt secondaries. This method replaces the former one of using maximum-demand meters which were used over a period of several days in one location. It has been found that the information obtained by the present method is of more value than that formerly obtained and may be gathered at considerably less expense.

The distribution engineer each day makes up a list of transformers to be tested that evening. Each crew, consisting of a testman and a lineman, makes tests from 6 p.m. to 9 p.m. during the peak of the lighting load. In this period one crew tests an average of fifteen transformers. Readings are taken on the outside line wires in each direction and also on the outside leads from the transformer to the line wires, making a maximum of six readings at each transformer.

Record of the readings is kept on the forms shown in the accompanying cut. The results of the test on transformer 619 D, for example, are shown in the first line. In the column headed "Transformer" is printed a diagram of the transformer and line wires. Tests on the north side of the transformer showed a load of 3 amp., and 6 amp. and tests on the south side a load of 10 amp. and 23 amp. Readings in the leads from the transformer to the line wires showed 14 amp. and 28 amp. respectively, which are expressed in the last column as percentages of rated load on the two halves of the transformer. Comparison of the readings on the north and south sides of the transformer indicates that the transformer does not stand in the center of its load. Furthermore, the load on the two sides of the secondary in each direction, as well as the load on the transformer itself, is badly unbalanced. The reading of 28 amp. shows also that the 5-kw. transformer cannot take on a great deal more load.

A. B. CAYO,
Assistant Superintendent of Distribution.
Portland (Ore.) Railway, Light & Power Company.

# Management and Policy

**Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods**

## Some Brand-New Arguments for Better Street Lighting

Test Figures Show How Greatly Modern Street Lighting Can Cut Down Crime and Traffic Accidents

THERE has been a pronounced swing over to residence lighting, sign lighting and street lighting within the past year. Salesmen who specialized on industrial lighting in 1919 and 1920 and who sold protective floodlighting in 1918 have had to develop other fields within the past year. Statistics show that the man who will concentrate his efforts on street lighting for the next year should realize in a big way.

Municipalities that have long been delaying the construction of various projects on behalf of the public health, convenience and safety are now loosening their purse strings, the two principal reasons being lower construction costs and the employment situation.

Some one says: "This ought to be a mighty good time to sell street lighting, but I am not the right man to sell it. I have never worked that field, and it would be foolish for me to try. It's a game that requires political influence, and political influence is the one thing I don't possess." Now, political influence is a good deal like the measles—a great many people have it in them long before they realize it. In this instance it is nothing more nor less than salesmanship, properly directed.

Some sales ammunition is available this year which did not exist before, namely, definite figures showing that high-candlepower street lighting greatly cuts down crime and traffic accidents.

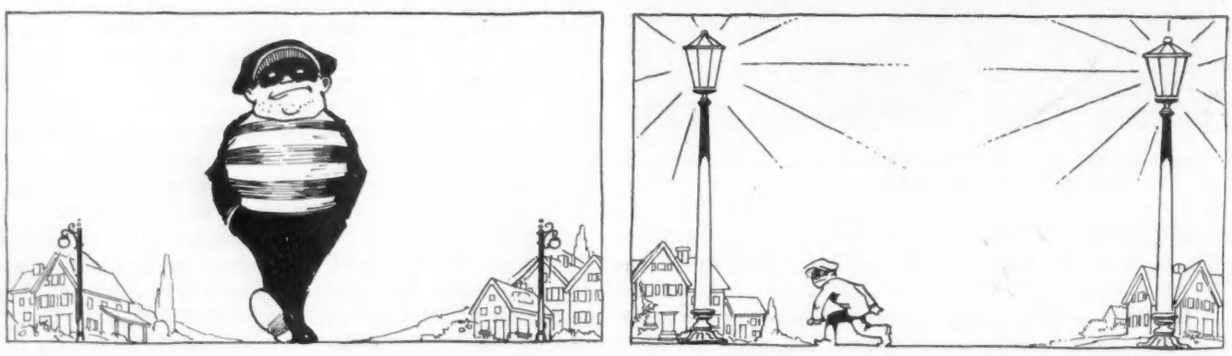
In Cleveland a crime investigation was made covering over a thousand cases of burglary, automobile stealing, robbery, pocketpicking and other crimes that flourish on poorly lighted streets. Lighting engineers checked up on the percentage of crimes committed at night and found that about nine out of every ten crimes occur after nightfall—only one during the hours of daylight. They also checked up on the influence of location. Taking 5 miles of downtown business streets —less than 1 per cent of the total street mileage of the city—it was found that these streets were the scene of fully 17 per cent of the night crimes. That, however, was before the complete overhauling and remodeling of the downtown street lighting. Superseding the former system, 600 ornamental posts were erected, all wires were put underground, and the posts were equipped with huge lanterns of rippled glass, each containing a lamp of at least 1,000 cp.—in some locations lamps of even 1,500 cp. were installed. Furthermore, the posts were spaced only 85 ft. apart—much closer than formerly and were arranged in pairs—a post on either side of the street forming a "lane of light" or "white way." What were the results?

Night street crimes in the downtown district showed an actual decrease during a period when crimes outside of that district increased by more than 50 per cent! In fact, there were 41 per cent fewer crimes on the "white way" than would naturally have been expected had there been no change in the lighting. Burglaries outside the "white way" increased 46 per cent, while on the "white way" they decreased 55 per cent.

As might naturally be expected from such benefits as these, Cleveland is now rapidly extending its high-candlepower gloom-dispelling system along the principal thoroughfares of the city.

It was also proved, by a separate investigation, that traffic hazard is measurably greater where there is lack of adequate lighting. A survey of the 3,549 street accidents that took place in one year in Cleveland showed that lack of illumination contributed to 38 per cent of the accidents occurring after nightfall. At least fourteen of these accidents to which lack of light contributed resulted fatally. The police records will show how many serious traffic accidents there were in any town last year.

While lighting engineers agree that even with 1,000-cp. lamps or bigger, supplemented by the most efficient equipment, they cannot furnish artificial street lighting that approaches the intensity of sunlight, without prohibitive cost, still they point out that it is entirely practical to provide from three to ten times as intense lighting as the average city now enjoys.

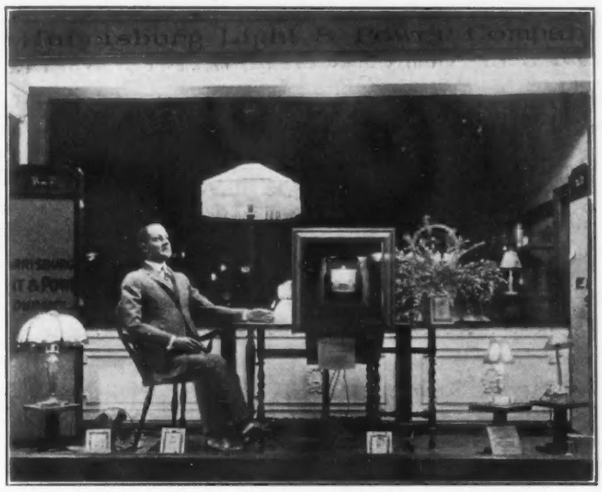


THE DIFFERENCE IN HEIGHT OF THE TWO THUGS INDICATES THE 41 PER CENT DECREASE IN NOCTURNAL STREET CRIMES EFFECTED BY HIGH-INTENSITY "WHITE WAY" LIGHTING IN CLEVELAND

## Contest Teaches Public How to Read Electric Meter

AS A MEANS of educating its customers to read their electric meters correctly the Harrisburg (Pa.) Light & Power Company recently conducted a meter-reading contest extending over twelve days. Prizes were offered to those who read the meter correctly the greatest number of times during that period.

As shown in the picture, a meter was placed in a



WINDOW DISPLAY FOR METER READING CONTEST

specially constructed shadow box 18 in. square in front and extending back 22 in. to a 9-in base just large enough to hold a 5-amp. meter. The box was surrounded in front by a gilt frame and lined with black velvet, a tubular lamp with a reflector lighting up the meter dial very distinctly. A time switch connected with the meter closed the circuit on two 100-watt lamps at midnight and opened it at 5 a.m., allowing readings to be taken over a period of nineteen hours. The meter used was equipped with a weak magnet which allowed the disk to run at 200 r.p.m., and a clock from a 150-amp. meter registered a total of 4,421 kw.-hr. during the twelve days, or 368.4 kw.-hr. per night.

The contest proved quite popular. Two of the prizes were won by women. In addition to arousing the interest of the public it influenced a great many persons to come into the company's office and learn how to read an electric meter.

## Inducing Customer-Owners to Reinvest Their Dividends

WHEN the quarterly dividend checks of the Central Connecticut Power & Light Company of East Hampton, Conn., are mailed to stockholders a courteous letter accompanies each check calling their attention to the possibility of further investment in the company's securities. The letter reads:

STOCKHOLDER:

We are inclosing check for the dividend earned by your investment in the preferred stock of the company during the period ending Sept. 30.

We trust the check will serve you as a reminder of the desirability of this security as a means of employment of your savings at as high an earning capacity as is consistent with wise investment.

This return from your investment is made possible by the stability of the earnings of the company. And may we ask you—while saving for further investment—to bear in mind that a higher income may be secured through investment in carefully selected public utility securities than can be obtained through other securities of equal reliability?

We look upon your investment with us as an earnest of your co-operation and good will, factors necessary to our mutual wellbeing and progress, and we trust that your plans for continued saving will include further investment in the company's preferred stock. Returns in the form of a generous quarterly dividend will be your reward. Yours very truly,

CENTRAL CONNECTICUT POWER & LIGHT COMPANY.
L. P. PERRY, Treasurer.

This letter in pointing out the desirability of the company's securities at an opportune time has been instrumental in causing a number of stockholders to turn their dividend checks back for investment in more stock.

## What Other Companies Are Doing

**Spokane, Wash.**—In order to stimulate merchandise sales during 1922 the Washington Water Power Company is planning to increase its advertising and sales efforts. Although door-to-door selling has not been necessary for the last two years, the company believes that this practice can profitably be resumed and that it will result in increasing the gross merchandise sales.

**Winston-Salem, N. C.**—The Southern Public Utilities Company reports having disposed of most of its post-wartime stock of appliances and is now directing its efforts toward the standardization of merchandise. This company is making a complete record of all appliances on its lines and has started a systematic house-to-house canvass for new customers as well as the sale of household appliances.

**Dayton, Ohio**—Members of the Lions' Club of Dayton were the guests on Jan. 5 of the Dayton Power & Light Company at the Miller's Ford power station of the company. Following a dinner prepared on an electric range, the club members made a tour of inspection of the plant.

**Milwaukee, Wis.**—In 1921 approximately 8,400 already-built houses were wired for electric service in addition to the several thousand new homes built in that city. The year was a record year in home building in this territory, but 1922 is expected to exceed it. The electrical interests in Milwaukee have combined to promote a better lighting campaign during December, January and February, and the Milwaukee Electric Railway & Light Company is devoting all its available forces to this activity. F. A. Coffin is sales manager.

**Baton Rouge, La.**—The Baton Rouge Electric Company reports that the outlook for merchandise sales in its territory during the coming year is good. While the prospects for the sale of washing machines have decreased because of cheaper domestic labor, it is expected that there will be a good demand for vacuum cleaners and the smaller household heating devices.

**Malden, Mass.**—A turn for the better in electric power business is reported by the Malden Electric Company, one of the Charles H. Tenney & Company properties north of Boston. Last week the company sold six motors aggregating 47.5 hp., not a large total in itself, but representing practically as many units as were sold in several months past. H. J. Walton, sales manager, feels that this purchasing of motors by local manufacturers is an index of an improving business outlook for the near future.

# Digest of Electrical Literature

**Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World**

## Motors, Generators and Transformers

*Heat Losses in Stranded Armature Conductors.*—WALDO V. LYON.—Heat losses in stranded conductors embedded in rectangular slots are calculated by the method of complex hyperbolic functions. The article deals with strands separated by insulation of appreciable thickness.—*Journal A. I. E. E.*, January, 1922.

*Adjustable Speed with Motor-Driven Mills.*—K. A. PAULY.—Two satisfactory systems of speed adjustments on rolling mills, the Kraemer and the Scherbius, are referred to with comments on the relative characteristics and particular work to which each is most adapted. Curves showing efficiency and power factor for typical loads are given. Duty-cycle curves of roughing and finishing mill loads are illustrated.—*Iron Age*, Dec. 22, 1921.

*Pneumatic Steam-Turbine Governor.*—D. L. BARBOUR.—Methods are described in which the air pressure produced by the fan on that end of turbine shaft acts upon aluminum disks that are connected to the valve stem lever. Slight changes of speed change the air pressure on disks, thereby operating the valve.—*Sibley Journal of Engineering*, January, 1922.

## Lamps and Lighting

*The Lighting of Coal Mines and Mining Properties.*—S. G. HIBBEN.—A description of the various types of miners' headlights and the method of lighting underground passageways.—*Electric Journal*, 1922.

## Generation, Transmission and Distribution

*New Electric Power Station at Runcorn.*—Description of a new power plant in which the exhaust steam from turbine-driven generators is utilized for evaporating brine in a vacuum plant. The coal and ash handling plant embodies the most recent improvements, from the English viewpoint, and it is expected that the steam consumption will be less than 10.15 lb. per kilowatt-hour. The station is laid out so that it may be extended for an ultimate rating of 100,000 kw. It differs from American practice chiefly in the switching equipment.—*Engineer* (*London*), Dec. 2, 1921.

*City of Chester Bulk Supply Scheme.*—An outline of the scheme, including a brief description of the station equipment and nature of the transmission lines.—*Electrical Times* (*London*), Dec. 15, 1921.

*Demonstration of an Automatic Coal-Mine Substation.*—A brief description of a semi-automatic substation recently installed at the Drifton colliery of the Lehigh Valley Coal Company, including an explanation of the sequence of operations and the various protective devices employed.—*Electrical Review*, Dec. 17, 1921.

*Modernizing the Cincinnati Traction Power System.*—Calls attention to large savings to be effected by scrapping long-obsolete generating equipment, building new substations and purchasing a portion of the energy required. Three automatic substations are included in the plan. Methods of undertaking the rehabilitation are discussed, and considerable attention is directed to the automatically controlled stations which form an important part.—*Electric Railway Journal*, Dec. 24, 1921.

*Water Powers of British Columbia.*—Refers to the report of Arthur White, consulting engineer to the Commission of Conservation of Canada, on the water power of British Columbia, calling attention to the principal parts of the report.—*Electrical Times* (*London*), Dec. 8, 1921.

*Waste Heat Utilized to Produce Electric Power.*—C. H. REEDER.—The Petoskey (Mich.) Portland Cement Company uses waste-heat boilers that are fed by the hot gases from the cement kilns. The cement plant is designed so that the waste from the boilers just about meets the power demands of the electrical equipment.—*Electric Review*, Dec. 31, 1921.

## Traction

*New Street Cars for Geneva.*—L. PAHIN.—Ten new eight-wheel, two-truck, central-entrance cars and ten new four-wheel, end-entrance cars have been added to the rolling stock of the street railways of Geneva. The motors are rated at 50 hp. and 27 hp. respectively, have four main and four commutating poles and are all equipped with ball bearings. The controllers have ten running positions and six stops for electric braking. All resistances are mounted on the roof of the cars.—*L'Industrie Electrique*, Dec. 10, 1921.

*Electric Locomotive Drives.*—Brief comments on two lines of development, namely, the quill and the coupling-rod types. Reference is made to experience of some American engineers, particular attention being called to some comparative tests of steam and electric locomotives. In conclusion the writer says: "It is quite possible that in freight working, or indeed in such passenger service as is probable in this country for some time, the quill or the direct drive may suffice, but there would seem, on the other hand, to be little doubt that the freedom in electrical design presented by the introduction of the coupling rod drive, taken with the indisputable advantage of the higher center of gravity, will insure this machine a very good share of popularity, especially where easy running and good speed are sought for on curved roads."—*Engineering* (London), Dec. 9, 1921.

*Chilean Railroad Electrification Program.*—Outline of plans for electrifying the first part of the Chilean State Railway, including 144 miles of track, with a brief description of the equipment which will be furnished to make this electrification possible.—*Railway Electrical Engineer*, December, 1921.

*Direct-Current 3,000-Volt Locomotives for the Paulista Railroad.*—JOHN A. CLARKE, JR.—A description of the electrification of the 28-mile (61-cm.) Jundiahy-Campinas section of the Companhia Paulista de Estradas

de Ferro in the State of São Paulo, Brazil. Each freight locomotive comprises six single-armature motors of 1,680 hp. and operates at a speed of 23.4 miles (37.6 km.) an hour, while the passenger locomotive has four double-armature motors rated at 2,240 hp. and a speed of 43.2 miles (69.5 km.) an hour.—*Electric Journal*, January, 1922.

*Electrification of Steel-Plant Railroad.*—R. B. GERHARDT.—Compares steam and electric industrial plant railroads. Data are given showing the relative cost of each, considering fuel, repairs and operating labor. Dangers of material or hot metal falling on third-rail installations are considered.—*Iron Age*, Dec. 29, 1921.

*Electric Tractors and Freight Transfer Service.*—Economies effected by the New York, New Haven & Hartford Railroad in handling less-than-carload shipments with electric tractors are described. The methods of handling are discussed and data given on the speed of handling and operating costs.—*Railway Electrical Engineer*, December, 1921.

## Telegraphy, Telephony and Signals

*Radio Equipment of the Ships Paris and Lafayette.*—On both ships 5-kw. tube senders were installed with a wave range of between 2,000 m. and 9,000 m. A 5-kw. motor-generator set is used to produce the plate high tension for four rectifying and four oscillatory tubes and the low-voltage current for the heating of the filaments of these tubes. Both vessels are equipped with a radio range finder or "radio goniometer." A distance of 3,400 km. has been covered safely by messages sent from the apparatus of the Paris.—*Radioélectricité*, November, 1921.

*The Ground Resistance of Antennas.*—A. MEISSNER.—How to build the most suitable antenna for a given station is one of the most important radio problems. Up to the year 1911 nothing but guesswork was done in building the aërial. For this reason Telefunken authorized a long series of tests with different antennas to determine their capacity, frequency, damping effect, effect of insulating all metal parts, etc. All tests were made between Nauen and Jena. The article contains the results of these and tests of similar character conducted by others.—*Jahrbuch der Drahtlosen Telegrafie*, November, 1921.

*Transmission of Wireless Signals Between Toulon and Tahiti.*—M. GUIERRE.—Investigations carried out to measure the strength of radio signals sent from Lyons and Nantes. Reception at ranges of 7,000 km. to 10,000 km. were made, in which comparisons were drawn between day and night receptions. Signals were found to be weaker in the Pacific than in the Indian Ocean, and the audible range of signals was not symmetrical.—*Radio Review*, December, 1921.

## Installations, Systems and Appliances

*Electric Power and the Rubber Industry.*—BYRON T. MOTTINGER.—A study of rubber, its manipulations and its physical properties, with a history of the most important steps in the development of power application to the rubber mills. Various methods of driving the process machines, such as direct, gear and belt, are considered.—*Electric Journal*, January, 1922.

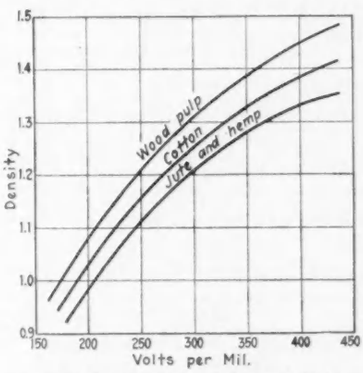
*Automatic Electric Welding.*—L. J. STEELE and H. MARTIN.—Abstract of paper presented before the Institution of Electrical Engineers, in which the authors take up the evolution of the "Cyc-Arc" process, experimental difficulties, essential adjustments to obtain satisfactory welds, the influence of arc lengths, timing and control apparatus, performance of the particular apparatus under consideration and results of welding experiments, reference being made to some practical applications.—*Electrician (London)*, Dec. 9, 1921.

*Stability of Conducting Furnace Hearth Structures.*—FRANK HODSON.—Emphasizes the necessity of giving particular consideration to the design and structure of the furnace hearth, the comments being based on one particular type in which relining was not required after four years of continuous operation.—*Electrical Review*, Dec. 17, 1921.

*Metallic Arc Welding of Manganese Steel.*—Points out that peculiar metallurgical characteristics must be taken into consideration to obtain the best results. The article also discusses the type of electrode material to use, most efficacious polarity, arc manipulations, welding procedure and finishing. The possibilities of increasing the speed of arc welding are considered.—*Railway Electrical Engineer*, December, 1921.

## Miscellaneous

*Industrial Research on Pressboard.*—A. P. M. FLEMING and ALLAN MONKHOUSE.—Experimental batches of pressboard were made from carefully chosen raw materials, and the results of tests on these led to the conclusions that (1) wood-pulp boards were too stiff for most purposes and liable to age rapidly, although their dielectric strength was good; (2) cotton boards were soft, porous, yielded a high dielectric strength and were also very pliable; (3) jute and hemp boards, although they showed a high dielectric strength, had the disadvantage that they became very brittle after prolonged immersion in hot oil; (4) linen boards were tough, pliable and showed a high dielectric strength. Further tests led to the conclusions that (1) the dielectric strength of pressboard is directly proportional to its density for any class of raw material; (2) the porosity and ability to absorb liquids also bear a direct relationship, however, dependent on the finish imported to the board and the method employed to obtain the denser board. It was also observed that the jute boards were the most absorbent of those tested.—*Electrician (London)*, Nov. 25, 1920.




RELATION BETWEEN DENSITY AND BREAKDOWN VOLTAGE FOR PRESSBOARD MADE FROM VARIOUS FIBERS

*World-Wide Power Development.*—A. H. GIBSON.—Emphasizes the attention which is being given to the subject in France, Italy, Japan, Canada and the United States and gives a table of available and developed power in all countries. Particular attention is devoted to the power available in Great Britain and the British Empire. The author concludes with an outline of the uses to which hydro-electric energy will be applied in the countries considered. The article is to be continued.—*Canadian Electrical News*, Dec. 15, 1921.

# Scientific and Industrial Research

(PRINTED IN THE THIRD ISSUE OF EACH MONTH)

**A Department Devoted to Reports of Investigations Contemplated or Completed, Research Facilities Available, and Suggestions for Co-operative Work.**

*Conducted by* PROF. VLADIMIR KARAPETOFF
Cornell University, Ithaca, N. Y.

## Research in Progress and Completed

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

ELECTRONICS, INVESTIGATIONS IN.

Two general types of inelastic impact between an electron and an atom may occur—the first of these results in an orbital shift of the electrons bound in the atom, and the second in the complete removal of an electron or ionization of the atom. The respective potential differences through which an electron must fall to acquire sufficient velocity for these two types of collision to occur are known as the resonance and ionization potentials for the particular element in question. The determination of these constants has been continued. Work of this character is of practical interest in the design of vacuum tubes, rectifiers, etc. Tables are available giving these constants for phosphorus, iodine, sulphur, nitrogen, oxygen and hydrogen and for zinc, cadmium, mercury, magnesium and calcium, with predicted data for strontium and barium.—*Bureau of Standards, Washington, D. C.*

CONCRETE FOR ELECTRICAL CONSTRUCTION.

The Hydro-Electric Power Commission of Ontario has made extensive researches on the manufacture of concrete, including methods of testing cement, sand and stone, both for quality and for their concrete-making properties; proportions of these ingredients to obtain concretes of the desired strengths; the effect of gradation, silt and impurities on the strength of concrete; the laws governing the plasticity of concrete mixtures; field methods of measuring, mixing and placing, and inspection of concrete.—*R. B. Young, Hydro-Electric Power Commission of Ontario, Toronto.*

MALLEABLE IRON INDUSTRY, ELECTRIC HEATING IN.

Development work and research are now being carried on in order to determine the scope of the field to which electric heating can be applied in the malleable iron industry, and data from actual installations will be analyzed.—*General Electric Company, Schenectady, New York.*

INSULATING MATERIALS, THERMAL CONDUCTIVITY OF.

Tubes were made of various insulating materials used in turbo-alternator slots and were heated by copper tubes placed inside. Temperatures inside the tubes and on both surfaces were measured with thermocouples, and from the known dimensions of the tubes the thermal conductivities of the materials were computed. The effect of prolonged excessive heating upon the dielectric strength was also ascertained. The results were published in the Bulletin of the *Société Francaise Electrique.—R. Jouast, Laboratoire Central d'Electricité, Paris, France.*

LAMPS, NEON.

Small neon lamps have been developed in which light is derived from an electrical discharge through rarefied neon gas, the light appearing as a soft orange glow. The lights are at present feeble, apparently less than 1 cp., but, as they can be made to consume only 5 watts on 220 volts, it is believed that they will prove useful as pilot lights, etc.—*Edison-Swan Electric Company, Ltd., London, England.*

CURRENT TRANSFORMERS, STUDIES OF.

The following studies have been recently made on current transformers: (a) Effect of magnetic leakage in different types; (b) errors in ratio and phase angle due to wave form; (c) errors due to the position of the primary conductor in a thorough-type portable transformer; (d) minimizing the errors by means of shunts of resistance or condensance, or both. The results will be described in detail in our bulletin.—*H. W. Price and C. K. Duff, University of Toronto, Toronto, Canada.*

MICA, DIELECTRIC CONSTANT OF.

The dielectric constant of twelve different grades of mica was determined at 1,000 cycles per second using a shielded capacity and conductance bridge to measure the capacity of the condenser formed by two mercury electrodes and the sheet of mica. It was found that mica in which air films could not be seen had an average dielectric constant of 8.1 with no difference between the various grades. Thick sheets with plainly visible air films had low dielectric constants (2.9 to 4.8), while sheets having stains had dielectric constants slightly above the average. The most probable cause of the low values of the dielectric constant is the existence of air films between the laminas.—*J. R. Weeks, Jr., Western Electric Company, New York.*

RADIO REFERENCE LISTS.

The Bureau of Standards has for some time carried on the compilation of a special list of references to papers of radio interest. Papers are noted as soon as they are published, and a list is issued twice each month. These references are classified according to an extension of the Dewey decimal classification, which was prepared at the bureau for this purpose. These lists are intended primarily for use by members of the staff of the bureau, but there is a very limited outside distribution. —*S. W. Stratton, Bureau of Standards, Washington, D. C.*

REFLECTOMETER FOR PHOTOMETRIC PURPOSES.

A simple and inexpensive reflectometer has been developed for measuring the reflection factor of surfaces. It may be of service for certain practical purposes where inaccuracies of 10 to 15 per cent are allowable.—*Bureau of Standards, Washington, D. C.*

AMPLIFIER, SUPERHETERODYNE, RESISTANCE COUPLED.

An experimental assembly of the superheterodyne system for short-wave reception, as suggested by E. H. Armstrong, was made, employing resistance coupling between the radio-frequency amplifier tubes. Common batteries for the filaments and for the plates were used and a grid condenser and leak were employed in each radio-frequency stage, thus introducing partial detection as well as amplification. A frequency of 120,000 cycles was found to give optimum radio-frequency amplification. The merits of the system as applicable to actual reception were also investigated.—*Radio Laboratory, School of Electrical Engineering, Cornell University, Ithaca, N. Y.*

STEEL, EUTECTOID CARBON, EFFECT OF RATE OF COOLING UPON MAGNETIC PROPERTIES.

Six specimens of eutectoid carbon steel were heated to 800 deg. C. and allowed to cool at various rates. Various magnetic and other observations were then made on each sample with the following results: (1) With a decrease in the cooling rate there is a marked increase in the value of the maximum induction for a given value of the magnetizing force, and an increase in the maximum permeability with a decrease in the coercive force. (2) As the structure is changed from an essentially sorbitic one to "divorced" pearlite, there is a gradual shifting toward the origin of the break in the reluctivity line and an increase in the difference between the "real" and "apparent" values of the maximum intensity of magnetization. (3) There is a good agreement between the values of the coercive force and the scleroscope hardness as affected by the various cooling rates.—*C. Nusbaum and W. L. Chency, Bureau of Standards, Washington, D. C.*

HOIST, MINE, DRUM-SHAPE.

The reduction of the acceleration peak in deep hoisting is an advantageous point which comes automatically with the coning of the drum. The problem is of considerable importance in connection with saving of power, reduction in the rating of the driving motor and increasing the mine output. For a discussion of a simpler problem when the shaft is shallow and the weight of the rope is unimportant, see article by F. L. Sloane, *A. I. E. E. Proceedings*, 1918, page 1203.

## Suggestions for Research

WELDING, ELECTRIC, MECHANICAL TESTS ON WELDS.

According to H. M. Hobart, fatigue tests of welded joints are most vital. The importance of obtaining reliable information as to how this test should be made probably transcends that attached to any other research in the field of fusion welding. He urges systematic tests with various well-known fatigue-testing machines in order that standard specifications for the testing procedure may be prepared.

LIGHTNING AND OVERHEAD GROUNDED WIRE.

There is a general research that would be valuable to transmission engineers relative to the effects of cloud lightning and the value of the overhead grounded wire. In a paper to be published in the January number of the *A. I. E. E. Journal* I have questioned the economic value of the overhead grounded wire in several of its applications. There is one analysis that is new, namely, the effect of resistance of the tower legs on the overhead wires, preventing arc-overs at the insulators. The overhead grounded wire loses one of its most important functions if it fails to prevent accidental arc-overs of insulators. It has not been possible to gather data of value on induced lightning strokes, owing to lack of recording instruments. Recently there has been made available a device for recording the values of the induced voltages. It consists of a sphere gap with a recording device in series and is known as a "transient voltage recorder." It does not record the exact voltage but simply that of a gap sparked over. With this and other devices it might now be possible to determine experimentally something about the value of the overhead grounded wire and also about the nature of ground induction.—*E. E. F. Creighton, Schenectady, N. Y.*

TURBO-GENERATORS, HUMIDITY OF SURROUNDING AIR.

The relative humidity of the air surrounding a high-tension generator, as well as of that used for cooling, is of great importance. A high humidity (up to 95 per cent) is desirable in order to drain off static charges promptly. If, however, precipitation of water is allowed to occur, insulation may deteriorate in weak places. It is desired to investigate this question thoroughly and to develop simple and sensitive means whereby the degree of humidity in the machine may be kept automatically within the best limits and an alarm promptly given when these limits have been exceeded.

RESISTORS, HIGH-RESISTANCE.

Resistors have been experimented with in Germany which are made of thin layers of carbon or metallic oxides deposited in the interior of glass tubes either as uniform coating or in spirals (*Zeits. Techn. Physik.*, Vol. I, page 256). With such a construction the conducting layer is well protected mechanically and at the same time is well cooled. Further experiments in this direction are desirable.

PRIMARY CELLS, ACCELERATED TESTS ON.

The difficulty in testing primary cells arises from the fact that identical cells yield widely different amounts of service under varying conditions. For this reason a life test must be practically a duplicate of the use to which similar cells are to be put. No way has been found as yet to make accelerated tests that will include all the factors entering into the performance of the cells. (Circular of Bureau of Standards, No. 79, page 32.) For practical purposes, especially for testing competitive cells, it would be very desirable to devise some short tests which would give at least an approximate idea of the expected life for a desired continuous or intermittent service.

# News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

## Tariff Bill May Be Reported Out of Committee This Month

UNQUESTIONABLY an earnest effort is being made by the finance committee of the Senate to report out the tariff bill at the earliest moment. Some of the Republican leaders, however, continue to be of the opinion that this is no time to attempt a permanent revision of the tariff and prefer to see the bill delayed still further.

The probabilities seem to be that the committee will be allowed to have its way and will report out a bill before the end of January. While it is known that there will be material changes in the House bill, including a material reduction in the level of most rates, no definite information as to its plans has gone out from the committee. The committee is supporting the American valuation idea, but it is very apparent that it is beset with uncertainties as to the practical application of that plan.

Consideration of the tariff on the floor of the Senate is certain to be more extended than usual. It is true that the Republicans have a majority of twenty-four in the Senate, but views on the tariff are much less partisan than they were when the Payne-Aldrich measure was enacted.

## Boston-Cleveland Comparisons Difficult, Says Wallis

NO SATISFACTORY comparisons can be drawn between such a central-station system as that of the Edison Electric Illuminating Company of Boston and the Cleveland municipal lighting plant for rate-making purposes, declared L. R. Wallis, superintendent of the former's sales department before the Massachusetts Department of Public Utilities last week. Representatives of the city went to Cleveland to make a study of operation under the municipal system in order to obtain data for the rate appeal brought by the city of Boston.

Questioned by petitioners' counsel, the witness pointed out that the Cleveland municipal plant charges a rate of 3 cents per kilowatt-hour for lighting energy, but that it serves a densely occupied and very limited area, with a total plant investment of about $6,000,000 against an investment of $59,506,000 by the Boston company, which provides lighting service in a territorial area of approximately 650 square miles.

It was brought out that if taxes are allowed for 1921, in accordance with precedent, the Cleveland municipal plant has lost money during the year. Extended comparative data were presented by Mr. Wallis showing that the Boston Edison system's area, more than double that served by the Cleveland Electric Illuminating Company, combined with a vastly greater underground system and with no gas service in the Ohio city and a 60 per cent larger Boston investment in plant, involves greater over-all costs of service in the former case and hence predicates higher rates.

## Financial Condition of Massachusetts Utilities Improving

ON THE whole, declared the Massachusetts Department of Public Utilities in its annual report to the incoming Legislature last week, the financial condition of the gas and electric companies of the state has improved within the past year. Several companies which have been carrying large floating debts have been able to finance these in whole or in part by the issue of permanent securities upon reasonably favorable terms. Others which had during the war years attempted to issue stock only to have a considerable proportion left on their hands have found it possible with the aid of recently passed and more flexible legislation to dispose of the remaining shares. Still others which have been postponing needed additions and improvements have found it possible to finance these and to proceed with the work. The commission points out that in view of the effect of the November sleet storm upon net earnings, it may be necessary to carry the cost of these extensions into succeeding years. The commission notes that fewer petitions for rate increases are being received and says that if no material increases occur in the prices of coal and oil, some reductions in rates may be expected as general business improves. Hitherto the loss of power business in particular has combined with relatively high fuel costs to render rate reductions difficult.

## Difference of Opinion as to Who Should Merchandise Appliances

CONSIDERABLE difference of opinion developed at the annual convention of the Massachusetts State Branch of the National Association of Electrical Contractors and Dealers, held Jan. 5 at Springfield, as to the desirability of central-station companies merchandising appliances. Representatives of the United Electric Light Company, Springfield, and of local contractor-dealer houses testified that in Springfield remarkably satisfactory results have followed the withdrawal of the company named from merchandising. C. Ernest Greenwood, superintendent appliance department, Boston Edison Company, in a written contribution, declared that the time has not arrived as yet when a wholesale withdrawal of central-station companies from this field would be for the good of the industry. There appeared to be a general recognition of the stimulus to appliance sales which central-station participation affords.

General agreement that the entire industry should work energetically to secure installation of more outlets in the home followed a long discussion of sales matters.

## Alaska and Iowa Projects Seek Permit from Power Commission

THE city of Wrangell, Alaska, has applied to the Federal Power Commission for a preliminary permit covering a power project on Mill Creek at a point 8 miles from Wrangell. The estimated primary capacity of the development is 1,000 hp., and it is the intention to install a plant of similar capacity. The power is to be used for public utility purposes.

The only other application received by the Power Commission during December was from the city of Oskaloosa, Iowa. Oskaloosa asks for a preliminary permit covering a dam and power house in the Des Moines River at a point just below Harvey. The estimated primary capacity of the development is 600 hp., and it is the intention to install a plant of 1,200 hp. capacity. The power is to be used for public utility purposes.

## Baltimore Engineers Oppose Legislation to License Profession

A PROPOSED state law requiring the registration and licensing of practicing engineers in Maryland caused an animated discussion at a recent meeting of the Engineers' Club of Baltimore which was largely attended by members of the national mechanical, electrical, civil, chemical and other technical societies. The final vote at this meeting was conclusively against the proposed legislation, and the motion passed expressing this opposition was subsequently approved unanimously at a meeting of the local section of the American Society of Mechanical Engineers.

The bill was, however, strongly supported by some Baltimore engineers, who asserted that they had met with obstacles in getting business in states which already have such laws, there being now fourteen such states. These advocates held that the bill would elevate the standing of the engineer, tend to increase his compensation and better protect the public. Their opponents disputed these arguments and insisted that no state-appointed board could properly grade and appraise the practitioners in a field so wide as engineering. Instead of falling into line with states where such statutes are on the books, the Baltimore antagonists of the measure were inclined to favor going into other states to lend assistance, if possible, to the repeal of such laws where they exist and to their prevention where they have not yet been enacted.

## Public Utility Securities Falling Due in 1922 Total $432,934,890

PUBLIC utility maturities in 1922 will be almost $128,000,000 in excess of those that fell due in 1921, according to the figures of the *Wall Street Journal*, the respective amounts being $432,934,890 and $305,110,350. The short-term notes which have been issued in large amount during the last few years because of the high rates for money will, it is expected, give place to long-term issues with the growing ease of the money market. The largest issues falling due in 1922 are $50,000,000 in three-year 6 per cent notes of the American Telephone & Telegraph Company, maturing Oct. 1, and $39,199,000 in one-year extended 8 per cent notes of the Interborough Rapid Transit Company, New York. Electric light and power company issues falling due, including those of combined gas and electric companies and combined railway and electric companies, are listed by Dow, Jones & Company approximately as follows:

| | | | |
|---|---|---|---|
| January | $5,300,000 | July | $6,300,000 |
| February | 30,400,000 | August | 20,500,000 |
| March | 28,500,000 | September | 19,100,000 |
| April | 2,400,000 | October | 8,400,000 |
| May | 15,600,000 | November | 9,250,000 |
| June | 8,900,000 | December | 11,500,000 |

These figures give a total of more than $166,000,000, of which the largest items are $12,500,000 of Philadelphia Electric 6 per cent notes and $16,000,000 of Boston Edison 5 and 6 per cent notes, falling due in February; $12,442,600 of Public Service of New Jersey 7 per cent convertible notes and $5,868,000 of Kansas City Gas & Electric first fives, falling due in March; $9,794,000 of Philadelphia Company convertible debenture fives and $5,000,000 of Mississippi Valley Gas & Electric collateral trust fives, falling due in May; $5,693,790 of Central States Electric 5 per cent notes, falling due in June; $5,000,000 of Consolidated Gas, Electric Light & Power 7 per cent notes, $5,000,000 of Consolidated Power of Baltimore 6 per cent notes and $4,950,000 of Metropolitan Edison first refunding fives, falling due in August; $8,272,000 of Utah Securities Corporation 6 per cent ten-year notes, falling due in September; $5,444,500 of Merchants' Heat & Light refunding fives, falling due in October; $7,500,000 of Brazilian Traction, Light & Power 6 per cent notes falling due in November, and $6,000,000 of Cincinnati Gas & Electric 8 per cent one-year notes, falling due in December.

## Fighting Ice Formation by Discharge of Tepid Water Into River

SPEAKING before the recent convention of the American Association for the Advancement of Science, held at Toronto, John Murphy, engineer of the Canadian Department of Railways and Canals, declared that it is possible to combat ice formation in rivers serving electric plants by spilling tepid water into them. Mr. Murphy said that the water for 13 miles of the Rock River in Illinois had for five winters been kept above the freezing point by the discharge into the river of two barrels of tepid water every second.

Mr. Murphy has been engaged for many years in studying the problem of prevention of ice formation, especially with relation to hydro-electric plant operation.

## Reading Will Substitute Electricity for Gas on All Streets

THE City Council of Reading, Pa., passed a resolution last week to discontinue all gas lamps for street lighting after 1921 and to install electric lighting throughout the city. The Council's action followed a notice from the Consumers' Gas Company that the rates charged for gas for city street lighting would be increased Jan. 1, under penalty of having the service discontinued. The letter suggested that the price be kept at its present figure with only 500 lamps instead of 581, thus allowing the company a larger revenue for the service. This suggestion was disregarded by the Council.

## Southern Electrical Men and N. E. L. A. Bureaus Confer at New Orleans

AT NEW ORLEANS on Jan. 17 to 20, under the auspices of the local Electrical League, a meeting of all electrical interests of the South and Southwest to discuss sales work was held jointly with the bureau and committee meetings of the Commercial Section of the National Electric Light Association scheduled for the same time in that city. Arrangements for this series of joint meetings were made by a committee representing the New Orleans Railway & Light Company and the electrical jobbers and contractor-dealers of the city. W. E. Clement of the New Orleans Railway & Light Company, chairman of the Commercial Section of the Southwestern Division of the N. E. L. A., was chairman of the program committee, and Col. Robley S. Stearnes acted as general chairman on the committee of arrangements.

Both morning and afternoon sessions of the first day were devoted to the work of the N. E. L. A. wiring committee. R. S. Hale, chairman, in a progress report outlined the standardization of wiring devices, heater cord connections, plugs and receptacles, and recommended changes in wiring needed to make the use of electrical heating devices convenient and the adoption of suitable plugs with a rating of 45 amp. for electric ranges.

### Contractor-Dealer Plan Vigorous Campaign

On Wednesday a joint meeting was held of the Mississippi State Association of Electrical Contractors and Dealers and the Louisiana Association of Electrical Contractors and Dealers. Members of the former body were invited by the Louisiana association to discuss plans for vigorous sales activity during the coming year. The following officers were elected by the Mississippi association: President, J. M. Fried, Vicksburg; vice-president, Joe D. Lanham, Greenwood; secretary, W. C. Warrick, Laurel. Plans were discussed for a meeting in July at Biloxi, and a committee was appointed consisting of three Mississippi representatives and three Louisiana representatives of the contractor-dealers and one electrical jobber to fix the date of another joint meeting.

At the Wednesday morning session meetings of the N. E. L. A. Lighting Sales Bureau and Power Sales Bureau were held. Ways and means for securing new business were taken up, and the committees were authorized to make recommendations to the executive committee of the N. E. L. A.

At the meeting of the Merchandise Sales Bureau Wednesday afternoon the question of electric range business was discussed and plans for the presentation of the annual report were briefly outlined. It is proposed in this report to present sales information from various sections of the country.

The meeting on Thursday morning, conducted by Leo Hirsch, president of the Electrical League of New Orleans, was a general one attended by all branches of the industry present at the meeting. Harold W. Newman, president of the New Orleans Stock Exchange, made an address of welcome, to which Executive Manager Aylesworth of the N. E. L. A. responded. Samuel A. Chase of the Westinghouse Merchandising Bureau spoke on "The Results of Team Work." A feature of this session was the presentation of a special illuminated film on dealer merchandising, displayed for the first time by Percival Stern, president of the Interstate Electric Company, New Orleans.

The Thursday afternoon session was devoted to meetings of the "Salesmen's Handbook" committee, the committee on electrically equipped furniture, and the committee on commercial service and relations with customers. A meeting of Southern jobbers was also held. Addresses at the main session were made by George H. Hughes, president Edison Electric Appliance Company, Chicago; Lawrence W. Davis of New York, representing the National Association of Electrical Contractors and Dealers; A. Hardgrave of Dallas, president Southwestern Geographic Division, N. E. L. A.; S. E. Doane, chief engineer National Lamp Works, Cleveland, and R. H. Tillman of Baltimore, chairman Commercial Section, N. E. L. A.

An elaborate entertainment program was provided, including an automobile tour, a special sightseeing trip and a banquet at the Southern Yacht Club, Col. Robley S. Stearnes being toastmaster. On Friday executive meetings were held.

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## Lockwood Committee Digs Deeper Into Incandescent-Lamp Business

THE manner in which the General Electric Company conducts its incandescent-lamp business was taken up again by the Lockwood legislative committee, following the testimony of H. W. Harper, reported last week. Those who appeared before the committee included August E. Wiest, head of the Crystalite Manufacturing Company, and Louis C. Kahle, its manager; Thomas Spina, manager of the Continental Lamp Company; Patrick J. Mee of the Daylight Lamp Company, Inc.; Alfred J. Liebmann, manager of the Elkhorn works of the General Electric Company and formerly manager and vice-president of the Independent Lamp & Wire Company; Lambert Schmidt, president of the General Illuminating Company; George K. Hamblin, of the Acton Lamp Company; Cornelius C. Billings, patent attorney and counsel of the Independent Lamp & Wire Company; Max E. Ebenstein, owner of the Electrical & Engineering Corporation; William A. Kennedy, sales manager of the Sibley-Pitman Electric Corporation; Charles P. Scott, secretary-treasurer of the Royal Eastern Electric Supply Company; Myer Zucker, of A. Schimmerl & Company, Inc., electrical supply jobbers; Walter Cary, vice-president of the Westinghouse Lamp Company, and Douglas Dewar, of Marwick, Mitchell & Company, accountants for the General Electric Company.

August E. Wiest, head of the Crystal Manufacturing Company of Union Hill, N. J., and as such a stockholder in the United Lamp Manufacturers' Corporation of New York City, proved to be the principal witness on Jan. 10. His connection with the electric bulb business began in 1915 with the American Appliance Company of Indianapolis, agent for the Franklin Electric Manufacturing Company, which in turn was a class B licensee of the General Electric Company.

According to the witness, the company "got caught" selling lamps below the price fixed by the General Electric Company, whereupon the Franklin company discontinued supplying it with lamps. Efforts were made, the witness said, to establish a source of supply from inde-

pendent manufacturers, but the supply was being restricted, and in February, 1920, the General Electric Company published a notice in a New York newspaper that it intended to prosecute all manufacturers of lamps infringing on its patents. Rather than involve the company's assets of $250,000 in litigation, Mr. Wiest said, it closed its branches when it was doing an annual business of more than $1,000,000. He severed his connection with the concern in October, 1920, taking for his interest the Crystal Light Company of Union Hill, which was controlled by the American Appliance Company.

In the spring of 1921, the witness continued, when his new venture was running along nicely, he was called on the telephone and asked to go to the office of F. S. Terry, one of the managers of the National Lamp Works of the General Electric Company. He said he was informed by Mr. Terry that his company was one of those infringing on the General Electric Company's patents. Negotiations were begun then for a license under which the witness would continue manufacturing and pay the General Electric a royalty, but his quota was to be fixed at $75,000, although he had been doing a business of $175,000. Eventually, he said, he was informed by Mr. Terry that his proposal for a license for the Crystal Light Company had been turned down.

### ORGANIZATION OF INDEPENDENT COMPANIES

Last August, Wiest, with several other independent manufacturers, organized the United Lamp Manufacturers' Corporation to market a complete line of lamps in uniform packing. Inside of two months the corporation was doing a business of $65,000 a month. The company since has been made defendant in a patent suit begun by the General Electric Company.

A. J. Liebmann, a former independent lamp manufacturer and part owner of the Independent Lamp & Wire Company, who sold out to the General Electric while his case was in the higher courts on appeal, admitted that the validity of the Coolidge patent which the General Electric claims to control had never been carried to the highest courts in this country, although the English court had declared the patent invalid. Although C. C. Billings, the patent lawyer for his company, had stated that there was a chance of winning the appeal from the adverse decision of the lower courts, the appeal was not pushed, but his company sold out to the General Electric while the case was on the calendar.

Lambert Schmidt, secretary of the licensees' association and president of the General Illuminating Company, was questioned by Mr. Untermyer. He is a minimum-quota man—that is, he is licensed to manufacture not more than $75,000 of tungsten lamps a year. Mr. Schmidt asserted that his profits on a business of this amount would not exceed 10 per cent. He has overstepped his quota of $75,000 and incurred the fine of the General Electric Company, which consists of a payment of 20 per cent of the amount by which the quota is exceeded and a reduction in the next year's quota by the amount of the excess. This wipes out his profit. He said the General Electric had never allowed one of its infringement suits to go to the Supreme Court on appeal, but had always bought out the alleged offender.

The only glass works in the country making bulbs outside the General Electric was the Corning Glass Company, he said. When he failed to get his orders filled by the Corning Glass Company he asked the General Electric to sell him bulbs. The first time the General Electric filled his order for bulbs he was billed by that concern, but the second time he was billed by the Corning Glass Company.

### PRICES OF LAMPS COMPARED

From Louis E. Kahle, manager of the Crystalite Manufacturing Company of East Orange, and Thomas Spina, manager of the Continental Lamp Works of New York, the committee learned of the profits in the manufacture of lamps.

Kahle said that when the General Electric bought out the companies included in the Independent Lamp & Wire Company the factories were closed. He was questioned on the cost of the tungsten filament lamp sold by the General Electric as the "Mazda" lamp, type B. The cost of a lamp made by his concern similar to the type B lamp of the General Electric was 16½ cents for the period ended Dec. 5, 1921, said Kahle. The cost was 15.7 cents somewhat earlier in the year, but the litigation begun by the General Electric against his company caused the increase in price.

The type B lamp of the General Electric Company was sold to the consumer for 40 cents, he said. Although the consumer pays 40 cents for the lamp, it is sold by his concern to the retailer for 19 cents.

Mr. Spina testified that lamps he manufactured, similar to those made by the General Electric, sold to the consumer from 200 to 300 per cent above the manufacturing cost, the resale price being fixed by the General Electric Company.

Here are some of the prices he gave to the committee: Type C 50-watt lamps, which cost Spina 22½ cents to make, were sold by the General Electric for 60 cents; 75-watt lamps, costing 24.127 cents, sold for 70 cents; 100-watt lamps, costing 28.4 cents, sold for $1; 150-watt lamps, costing 31.9 cents, sold for $1.40; 200-watt lamps, costing 40 cents, sold for $1.90; 300-watt lamps, costing 60.5 cents, sold for $2.80; 500-watt lamps, costing $1.09, sold for $4.15; 750-watt lamps, costing $1.67, sold for $5.75; 1,000-watt lamps, costing $1.72, sold for $6.70.

It was pointed out that the cost prices of these lamps were the cost to small independent manufacturers and that the General Electric Company by mass production and by controlling the constituents of lamps was enabled to reduce costs considerably.

William A. Kennedy, sales manager of the Sibley-Pittman Company, and Charles Scott of the Royal Eastern Electric Supply Company, jobbers for the General Electric Company, and Myer Zucker, a wholesaler for the Westinghouse Electric Company, told of their working sales contracts and their relations with "retailer-agents."

### ARRANGEMENTS WITH WESTINGHOUSE LAMP COMPANY

Mr. Cary of the Westinghouse company signed a waiver of immunity on taking the stand. He said that the Westinghouse Lamp Company was licensed to do 17.25 per cent of the lamp business and that if it exceeded that quota it had to pay 10 per cent royalties on the excess. The Westinghouse Lamp Company observed the price of the General Electric because of this agreement, but he testified that its quota was not reduced when it exceeded it. In 1920 the Westinghouse company exceeded its quota by $200,000, he said. Mr. Untermyer brought out that this was one-half of 1 per cent of its business.

The witness was examined on the Toledo decree and admitted that the Westinghouse and the General Electric

were defendants and were enjoined from conspiring to do business under the resale plan. He readily admitted that his company had a resale arrangement, but denied that the consignment was the same as the resale plan.

"You claim they are consignees, and we claim that is a mere cover," commented Mr. Untermyer.

"I don't know what you claim," Mr. Cary declared.

"I am telling you now," added Mr. Untermyer. "We claim it is a transparent, frivolous cover and you are claiming they are consignees. Isn't that about it?"

"We claim they are agents," the witness replied. "We consign lamps to them."

It was brought out that the Toledo decree forbade the General Electric from acquiring the Franklin Electric Company. However, in 1918, the Franklin company was absorbed by the Westinghouse. Mr. Cary did not consider this act an evasion of the spirit of the decree. It then appeared that after the Westinghouse company acquired the Franklin concern it closed down the two plants of the latter organization. The Franklin company had previously, in its turn, absorbed several electric companies and closed them down.

Mr. Cary admitted that in making consignments to class B agents, as jobbers are designated, and class A agents, as retailers are termed, losses to class B agents had to be made up by them even though they were consignees. He asserted that this has been averaged over a period of years and had been figured in the compensation paid class B agents. The witness was asked how the agents of the Westinghouse Lamp Company knew the prices they were expected to pay when goods were sent on consignment. He said that a consignment bill was sent along with the goods. The agent received a list price showing his "schedule of compensation" when he is appointed as an agent, he added.

"And that is his fixed price?" asked Mr. Untermyer. "It is not any fixed price at all; it is a commission," replied the witness.

It developed that the Westinghouse, under its agreement with the General Electric, paid the same commissions to agents as the General Electric. Cary said if he paid less compensation he would not have any agents. Mr. Untermyer suggested that if he paid more compensation the General Electric would not have any agents. It was here that Mr. Cary declared that would mean breaking an agreement, asking whether the committee would ask him to do that. Mr. Untermyer then made a statement about the desirability, to his mind, of "smashing" the agreement.

The Westinghouse Lamp Company did a business last year of $10,000,000 in bulbs, being the largest licensee of the General Electric, the witness said.

Through the testimony of Douglas Dewar, a public accountant employed by the General Electric to audit its books, Mr. Untermyer developed that in the twenty-eight-year period ended Dec. 31, 1920, the company had spent more than $182,000,000 for its various plants. Despite the fact that about $60,000,000 of this was spent for improvements within the last two years, he pointed out, the total value of all the company's property was set down in its 1920 report as only $66,000,000.

Mr. Untermyer characterized this "writing down" process as "grossly misleading," saying it was done "in order to keep the profits of the General Electric Company from looking too big."

Dewar denied that the General Electric Company was trying to evade the federal taxes, saying that the figuring in the reports was based on war-time depreciation.

## Department of Justice to Investigate General Electric Company

ANNOUNCEMENT was made in Washington on Tuesday that as a result of letters to the Department of Justice from counsel of the General Electric Company and also of charges made by Samuel Untermyer, counsel of the Lockwood legislative committee, the Attorney-General has ordered an investigation of the General Electric Company to ascertain if it has violated any federal laws.

The Attorney-General said that he expected that the minutes of the Lockwood committee would be available to Department of Justice investigators. If violations of federal laws are uncovered, the department will proceed against the company in the United States courts, while if any departures from state statutes are found, this information will be turned over to counsel of the New York State investigating committee.

Acting upon the Lockwood committee charges, the department will investigate the following questions involved in accusations against the company: Whether it maintains an unlawful monopoly of tungsten incandescent lamps; whether it has made unlawful contracts; whether it has manipulated its accounts and evaded the payment of excess-profits taxes, and whether it has been operating in violation of a decree handed down by federal courts in Ohio in 1911.

Experts from the Internal Revenue Bureau will be called upon to assist the Department of Justice in examining the General Electric's books and tax returns. The Attorney-General said that he would detail three members of his department to conduct the investigation.

## Ohio Brass Gets the Final Decision in Suspension-Insulator Case

WHILE affirming the decision of the United States District Court of New Jersey in the suit brought by the General Electric Company against the Ohio Brass Company for contributory infringement of the Buck-Hawlett patent, No. 2,925,561, for a system of suspension of high-tension lines, the United States Circuit Court of Appeals has based its finding for the defendant on an entirely different ground. The lower court in its decision, in November, 1920, refused to consider the validity of the patent, holding that the evidence showed no infringement. The higher court, however, found the patent to be invalid and that consequently there could be no infringement.

The case has been in the courts for the past eleven years, and all told about 6,000 pages of testimony have been taken. Witnesses came from all over North and South America. The record is virtually a complete history of suspension insulator practice prior to 1906, when the patent was applied for.

The patent involved a freely suspended system operating at from 60,000 volts to 100,000 volts, periodically dead-ended to cross-arms using a special type of disk insulator and a freely suspended jumper. The Hewlett insulator is the subject of another patent, and infringement thereof was not claimed, but merely of the system of suspension.

The Court of Appeals held that the invention in suit was anticipated by a line erected in 1900 in Indianapolis. The court further held that an insulator of a specific type and an insulator of a more general

type in combination with expedients appropriated for the art are not inventions, first because they are not a combination that, in the patent sense, is new, and second because otherwise the common expedients of the art, such as poles and conductors, would be foreclosed to the industry on systems falling within the claims of the patent.

"As drawn," says the court, "the patent to Buck and Hewlett grants them not merely a monopoly of a system of electrical transmission, but, in effect, expands the Hewlett patent for an insulator and permits it to embrace and monopolize the named expedients of the art, thereby bringing about infringement whenever these expedients are used in combination with insulators of others, which, though not infringing the Hewlett insulator, fall within its broad description. The Buck and Hewlett patent for a system, built around the Hewlett insulator pretty nearly, if not entirely, covers the whole art, present and prospective, of insulators in series flexibly connected, whether the insulating members be disks, globes or other shapes."

## International Joint Commission Reports on St. Lawrence Developments

IMPROVEMENT of the St. Lawrence River as recommended in the report of Col. W. P. Wooten and W. A. Bowden, engineers appointed by the United States and Canadian governments respectively, is indorsed by the International Joint Commission in a report submitted to Congress on Jan. 16. In the Senate the report was referred immediately to the committee on foreign relations. In the House no disposition was made of the report pending the outcome of a fight as to its reference.

The commission believes that the greatest beneficial use of the waters of the St. Lawrence River between Montreal and Lake Ontario may be obtained by a combination of navigation and power development in the international section and of navigation alone in the national section with power development therein at some future date.

The estimated cost of the completed work between Montreal and Lake Ontario, as recommended by the Engineering Board, is about $252,000,000. To this must be added the cost of the new Welland Ship Canal in order to ascertain the total expenditure involved.

With regard to water source the report says: "The terms of the reference make it clear, in the opinion of the commission, that the intention of the two governments was that the proposed improvement of the Upper St. Lawrence should serve primarily the interests of navigation and commerce and only incidentally those of water power. The first and principal question reads: 'What further improvement in the St. Lawrence River between Montreal and Lake Ontario is necessary to make the same navigable for deep-draft vessels of either the lake or ocean-going type, what draft of water is recommended, and what is the estimated cost?' In answering this question the commission is requested to consider two alternative schemes, one providing for navigation interests alone and the other for a combination of navigation and power interests 'to obtain the greatest beneficial use of the waters of the river.' The scheme recommended—that is, a combination of navigation and power in the international section of the river—does, in the opinion of the commission, insure the maximum efficiency from the waters of the St. Lawrence both for navigation and water power."

In regard to the electrification of railways the report holds that there is much force in the argument that, given a sufficient and conveniently located supply of power at a reasonable cost, railways would be transformed from steam to electricity, but it must not be lost sight of that other factors enter into the problem, particularly the capital cost of the proposed change. In any event the question is one for the railway companies, which are the best judges as to the circumstances under which electrification would be economically a sound policy, and while the commission believes that ultimately electrification will be applied to all the principal railway lines, there does not appear to be any immediate prospect of a movement in that direction on the part of railways that might be served with power from the St. Lawrence.

The commission is of the opinion that in so far as markets are likely to be available for St. Lawrence power within a reasonable period after the St. Lawrence improvements have been completed, the situation is substantially as follows:

Those who have given particular attention to this matter, both in the United States and Canada, are for the most part of the opinion that markets will be available to absorb all the power that can be developed on the international section of the St. Lawrence within a reasonable period after the completion of the proposed works. The commission has before it graphs Nos. 3 and 5, showing the present use of power on both sides of the boundary within a radius of approximately 300 miles of the Long Sault Rapids, and also the probable future demand. It appears from these graphs that at the present time (1921) the total primary power installation on the United States side of the 300-mile area is approximately 9,900,000 hp. and on the Canadian side 1,900,000 hp. The estimated demand on the United States side in 1925 is 11,000,000 hp. and on the Canadian side 2,350,000 hp., and in 1930, on the United States side 12,500,000 hp. and on the Canadian side 2,875,000 hp.

The director of the United States Geological Survey is of the opinion that "the demand in New York and New England would take care of all the power that might be developed on the St. Lawrence as soon as it was made available," and this opinion is confirmed by the report on the proposed Superpower System. Evidence as to the demand on the Canadian side of the area goes to show that ultimately Canada will be in a position to use her share of the available power on the international section of the St. Lawrence, although obviously for some years after the works are completed there will be a much greater demand for power by the United States than by Canada.

## Congress to Pass on Ford's Muscle Shoals Offer

HENRY FORD'S offer for purchase and lease of the government's nitrate and water-power projects at Muscle Shoals, Ala., will be referred to Congress for final decision, it was announced at the conclusion of a conference between government officials and Mr. Ford last week. Accompanying the Ford proposal when it is transmitted, Secretary Weeks said, probably would be the two offers received from Frederick Engstrum of Wilmington, N. C., and C. C. Tinkler of San Francisco.

# Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

**New Booklet of Society for Electrical Development.** — "More Leisure Time" is the title of a booklet just issued by the Society for Electrical Development and now ready for distribution. In twenty-four entertainingly written and illustrated pages the booklet tells how hours of drudgery may be eliminated by the use of electric service and appliances. The booklet, which was written by a woman, makes an especial appeal to housewives.

**World's Wireless Stations.**—The International Telegraph Bureau at Berne, Switzerland, has just published a report about the world's wireless stations. According to these figures, there existed at the end of the year 1920 in the whole world 13,694 wireless stations, of which 977 were on land and 12,622 on board ships. The total number of wireless stations in 1913 was 508, in 1918 3,998 and 1919 6,320. It will be seen that the largest increase took place during the year 1920.

**Railroad Electrification in South Africa.**—The government of the Union of South Africa is to proceed with the electrification of the section of the Durban-Pietermaritzburg Railway between Pietermaritzburg and Glencoe, a distance of 171 miles. The direct-current system at 3,000 volts will be employed, and the total cost will be between £3,000,000 and £4,000,000. Eventually it is hoped that the entire railroad as well as the line from Cape Town to Simonstown will be electrified.

**Accidents from High-Tension Lines.**—Forty-two deaths and forty-eight cases of injury, exclusive of accidents on electric railways, are reported as occurring in Switzerland in 1920 from electricity. Accidents numbered eighty-two. This increase over previous years was of course due to the rapid extension of electrical development, and it is gratifying to note that the figures for 1921, so far as they are known, show a marked reduction as safety methods have become more generally understood. An interesting classification of the accidents has been made on the following basis: Persons who came in contact with tensions not exceeding 250 volts, fourteen injured, four killed; with tensions between 251 and 500 volts, nine injured, twelve killed; with tensions between 1,000 and 5,000 volts, two injured, four killed; with tensions between 5,001 and 10,000 volts, nine injured, four killed; with tensions exceeding 10,000 volts, fourteen injured, eighteen killed. In all save two cases the current was alternating.

**Winnipeg Duplicates Transmission Line.**—Owing to the fact that all the civic utilities of Winnipeg, Manitoba, depend upon a continuous supply of power for their operation and to the tremendous growth of domestic load caused by the general use of electric ranges and other conveniences, the hydro-electric system of the city has found it necessary to take every reasonable precaution to insure continuity of service. With this aim it has recently completed a duplicate transmission line between the power house on the Winnipeg River and the city, a distance of 77 miles, making a total of four circuits. The new line uses three types of towers—a latticed pole, a standard braced tower and a special dead-ending and angle tower.

**World's Greatest Lighthouse to Be Built in France.**—A billion candlepower is to be the rating of a new electric lighthouse to be built by the Technical Aëronautic Service of France on top of Mount Afrique, near Dijon, to aid the pilots of airships flying at night between Paris and Algiers, Mediterranean ports and points in Italy, Switzerland and elsewhere. This, it is said, will be by far the most powerful lighthouse in the world, from 30,000,000 cp. to 40,000,000 cp. having been found adequate for maritime lighthouses. Hitherto the lighthouses built to aid aërial navigation in France have been served by acetylene gas or by incandescent lamps and have been able to throw their beams only 25 or 30 miles. This has failed to make it possible for airplanes flying at a height of 10,000 ft. and at a speed of 124 miles an hour to pick out important points, such as the junctions of routes. The new lighthouse, as described in *Le Genie Civil*, will contain eight great lenses, each illuminated by a continuous-current arc lamp rated at 65 volts and 120 amp. at maximum capacity.

**Hydro-Electric Steam Generators Cost Less than Coal-Fired Boilers.**—The employment of high-power electric steam generators instead of coal-fired boilers, reports of which have come from Europe, is said to be attracting great interest, particularly among paper manufacturers, in this country, and apparatus of this kind is being developed by American manufacturers. A large Canadian paper mill has, it is reported, obtained 60,000 lb. of steam an hour twenty-four hours daily for four months from a 20,000-kw. hydro-electric steam generator. This is rated as the largest plant of the kind known and was the first put into commercial operation in the Western Hemisphere. Engineers of the paper company are said to estimate a saving of $4,000 a month with the new system, which will save 75 tons of coal a day. Installation costs, about $25,000, were 40 per cent less than the cost of installing the coal-burning plant that has been replaced. The efficiency of the electric steam generators is put at 90 per cent, while that of the largest coal-fired boilers only approximates 7 per cent. The American-built apparatus is larger than that so far made abroad.

# Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

**St. Louis Section, A. I. E. E.**—C. C. Robinson, electrical engineer for the Union Electric Light & Power Company, has been elected as chairman of this section, succeeding J. L. Woodress.

**American Society of Heating and Ventilating Engineers.** — The annual meeting of this society will be held at the Hotel Pennsylvania, New York City, on Jan. 24-26. At the industrial session on the last day "The Control of Blower Motors," by Henry H. Issertel, and "The Under-Feed Stoker," by Frank A. DeBoos, will be among the papers presented.

**Empire State Gas and Electric Association.**—The Electric Meter Section of this association will meet in New York City on Feb. 24. The two principal topics for consideration at this meeting and for study during the year will be, first, the demand-meter situation, including a compilation of data as to the types in use and the experience of the companies with them, and, second, Public Service Commission Order No. 278, relative to periodic testing of watt-hour meters.

**Rocky Mountain Electrical Co-operative League.** — At the annual meeting of the advisory committee of the Rocky Mountain Electrical Co-operative League the following officers of the committee were unanimously elected for the coming year: Chairman, P. M. Parry; vice-chairman, J. A. Kahn; secretary and treasurer (re-elected), R. M. Bleak. Mr. Parry is commercial manager of the Utah Power & Light Company. Mr. Kahn is president of the Capital Electric Company, and Mr. Bleak is superintendent of lighting and appliance sales of the Utah Power & Light Company.

### Coming Meetings of Electrical and Other Technical Societies

A. I. and S. E. E. Section Meetings—Pittsburgh, Jan. 21; Chicago, Jan. 27; Birmingham, Jan. 28; Philadelphia, Feb. 4; Cleveland, Feb. 13.

American Society of Heating and Ventilating Engineers—New York, Jan. 24-26.

A. I. E. E. Section Meetings—Boston, Jan. 24; Atlanta, Jan. 26; New York, Jan. 27; Utah, Jan. 27; Vancouver, Feb. 3; Providence, Feb. 3; Los Angeles, Feb. 13.

Association of Municipal Electrical Utilities of Ontario—Toronto, Jan. 26-27.

Lighting Fixture Dealers' Society of America—Milwaukee, Jan. 30-Feb. 2.

New Mexico Electrical Association—Albuquerque, Feb. 13-14.

Pennsylvania State Association of Electrical Contractors and Dealers—Allentown, Feb. 15.

American Institute of Electrical Engineers—Midwinter convention, New York City, Feb. 15-17. (For program see issue of Jan. 7, page 51.)

# Recent Court Decisions

**Findings of higher courts in legal cases involving electric light, power and other public utility companies**

**When Court May Dismiss Damage Suit Upon Demurrer.**—It is only where it clearly appears from the petition that the negligence charged against the defendant was not the proximate and effective cause of the injury that the court may, upon general demurrer, as a matter of law, so determine, declared the Georgia Court of Appeals in reversing the lower court in Larkin vs. Andrews, a case which had been withheld from the jury as failing to set out a cause of action, notwithstanding that the plaintiff swore that in avoiding an automobile he had stepped a few feet from a roadway and come into contact with a heavily charged electric wire which had lain for weeks where it had fallen, hidden under weeds, as, it was averred, the defendant in the exercise of ordinary diligence should have known. (109 S. E. 518.)*

**Municipal Powers Under Ohio Law.**—The Supreme Court of Ohio, in United Fuel Gas Company vs. Public Utilities Commission, a suit brought to upset a decision of the commission dismissing the company's appeal against a rate ordinance of the city of Ironton, found that under the Ohio statutes the City Council could regulate from time to time the price a gas company might charge by ordinances establishing a rate for ten years, and on the expiration of such period the city could by ordinance regulate the price for the three years remaining under the original franchise contract, and the company's refusal to accept the ordinance did not nullify the city's power. A provision of the ordinance requiring the furnishing of gas free for certain municipal purposes was, however, beyond the Council's power unless agreed to by the company. (132 N. E. 845.)

**Water-Power Contract Held to Permit Abrogation by Either Party When Supply Proved Unsatisfactory.**—In an action brought by the Kansas Electric Utilities Company against the Bowersock Mills & Power Company to restrain the defendant from abrogating a twenty-one-year contract entered into in 1909 to furnish power to the plaintiff, the Kansas Supreme Court, reversing the prior judgment, found that a provision in the contract for ascertaining after careful trial whether the water power was satisfactory did not refer to a single specific test, or mean that if such a test was satisfactory, then the defendant must continue to furnish all the energy required by plaintiff to the end of the contract period, but, on the contrary, referred to a continuous possibility of the water power proving unsatisfactory at any time and permitted either party to abrogate the contract in such a contingency. (202 Pac. 92.)

**Constitutionality of Kansas Industrial Court Again Affirmed.**—The Supreme Court of Kansas has once more affirmed the constitutionality of the Industrial Court of that state, which was again assailed in State vs. Howat, the court declaring that no reason existed to lead it to alter its previous attitude. (202 Pac. 72.)

**Order Continued in Dispute Between Southern Power and North Carolina Public Service Companies.**—Pending trial settlement of mandamus proceedings in the United States Circuit Court of Appeals, the Southern Power Company must continue selling electricity to the North Carolina Public Service Company, which supplies the cities of Greensboro and High Point with electrical energy, an order to that effect having been entered in the appellate court at Charlotte, N. C. The order simply continues the order of the district court, which, after refusing a mandamus at Greensboro, directed that the Southern Power Company should continue selling energy to the North Carolina Public Service Company for a period of six months from June 29, 1921. The Southern Power Company, with headquarters at Charlotte, N. C., is resisting efforts of the other company to compel it to furnish it with energy. A final decision is expected at the February term of the appellate court.

**Implied Promise to Pay for Right-of-Way Where Written Agreement Is Lacking.**—The case of Krueger et al. vs. Topp-Stewart Tractor Company et al. concerned payment for a right-of-way granted by plaintiffs across their farm and occupied by defendant's power-transmission line, nothing having ever been paid for the grant and no price having been named. The Supreme Court of Wisconsin held that under such circumstances the law implies a promise to pay what the grant is reasonably worth. Market value did not enter into the question, and the sum due should be determined by evidence including the same elements of damage as are involved in fixing compensation under condemnation proceedings. It appeared that the plaintiffs had granted the right to the Topp-Stewart company, relying on what they understood to be oral promises to furnish them with light and power in return, and that on the sale of the line to the Central Wisconsin Power Company, a co-defendant in the suit, they were informed that the only way they could obtain light and power was either to build a line from the power house to their premises or to purchase a transformer. The Central Wisconsin company disclaimed all knowledge of the alleged oral agreement. (185 N. W. 249.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

# Commission Rulings

**Important decisions of various state bodies involving or affecting electric light and power utilities**

**Penalty for Slow Payment.**—In passing upon a complaint against a gas company the Missouri Public Service Commission held that the imposition of an additional charge or penalty to cover the expenses caused by the delay of customers to pay their bills is reasonable and lawful. Its purpose, the commission pointed out, is to bring about prompt payment, thereby diminishing collection expenses and placing upon the delinquent customer the extra cost of the service caused by his failure to pay promptly. There is no difference in principle between a discount for prompt payment and a penalty for delay. Such a penalty is not a double charge, and the public throughout the country has very generally acquiesced in the fairness of its collection. The commission, however, in another instance, has refused to allow a telephone company to discontinue service to a subscriber on account of former delinquency and poor credit standing.

**Telluride Power Company Granted Rate Increase.**—The Telluride Power Company, which serves a large portion of southern Utah, has been granted an increase in rates by the Public Utilities Commission of Utah, which will increase its revenues by about 16 per cent, or about half the sum asked for. The new rate for residential lighting runs from 14 cents per kilowatt-hour for the first 30 kw. of monthly consumption down to 9 cents per kilowatt-hour for all consumption per month in excess of 60 kw. Commercial lighting rates have a similar range, but with different consumption factors. The town of Panguitch, which had been on a separate schedule somewhat higher than that in effect elsewhere on the system, now goes on the same schedule, though not on the interconnected system of the Telluride. The commission criticised unreasonable opposition to rate advances, saying: "During the war period a customary objection made by a class of protestants at rate hearings was to the effect that prices of every kind were advancing with great rapidity and the public generally was carrying heavy burdens. This being true, the commission was asked to deny relief, regardless of the showing made, until after the war was over; then rates might be adjusted to meet outgo. Since the war this class of objection has taken the form that, though the war is over, the time is not yet to adjust rates, but that some time, when prices are stabilized, income might be adjusted to outlay, and, further, that in unregulated industries prices are now declining."

# Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

**C. E. Calder** has recently been elected president of the Dallas Power & Light Company and the Texas Power & Light

C. E. CALDER

Company. Mr. Calder comes to this new position after some sixteen years of varied experience in public utility operations. In 1906 he became cost analysis engineer on construction and reconstruction of the street railway, electric light and gas properties of the Tri-City Railway & Light Company at Davenport, Iowa, and Rock Island and Moline, Ill., which work was being carried on by J. G. White & Company of New York. In December, 1907, he became associated with the Eastern Pennsylvania Railways Company and Eastern Pennsylvania Light, Heat & Power Company as assistant treasurer in charge of the accounting for these companies. Later he was appointed purchasing agent in addition to his accounting duties and elected secretary and treasurer of the Eastern Pennsylvania Railways group of properties. In March, 1913, Mr. Calder became connected with the Electric Bond & Share Company of New York as secretary of the Texas Power & Light Company and affiliated companies, with headquarters at Dallas, Tex. In 1917 the Dallas Railway Company and Dallas Power & Light Company came under the management of the Electric Bond & Share Company, and Mr. Calder was elected vice-president of all the companies of which Colonel J. F. Strickland was then president. These consisted of the Texas Power & Light Company, Dallas Power & Light Company, Dallas Railway Company and Texas Electric Railway. Upon the death of Mr. Strickland Mr. Calder was elected president of the Dallas Power & Light Company and Texas Power & Light Company and discontinued his connection with the Dallas Railway Company and Texas Electric Railway.

**C. C. Levis,** manager of the New York office of H. M. Byllesby & Company, Inc., and the company's Eastern representative, has been elected to the directorate of the Standard Gas & Electric Company. Mr. Levis has been connected with the electric light and power industry for the past fifteen years. From 1907 to 1914 he was connected with the General Electric Company and its allied interests in England, taking a two years' course in the works of the British Thomson-Houston Company, Ltd., and later handling the Far Eastern business of the company. In 1914 he joined H. M. Byllesby & Company, Inc., and he has been connected with this company since that time, with the exception of two years' service in the army.

**Joe Carmichael** has been selected to head the Iowa Committee on Public Utility Information, with headquarters at Des Moines. Mr. Carmichael, who is a veteran newspaper man, has been editor of the *Daily Times*, Davenport, Iowa, for the past eighteen years and for the last eight months has been the advertising manager of that publication. This newly organized bureau will co-operate with the Iowa Sections of the

JOE CARMICHAEL

American Electric Railway Association, the American Gas Association and the National Electric Light Association. It will collect consolidated authoritative data on the industry and will disseminate it impartially.

**R. O. Launey,** recently appointed auditor of the Brooklyn (N. Y.) Edison Company, is one of the most widely known accountants in the electric light and power industry. Mr. Launey has been a public utility accountant for the past eighteen years. His first position, beginning in 1904, was with the Birmingham Railway, Light and Power Company. In 1913 he was appointed auditor of that company after having held nearly every position in the accounting department. On April 1, 1917, in addition to the post just named, he was made auditor of the Southern proper-

R. O. LAUNEY

ties of the United Gas & Electric Engineering Corporation, which included the Consumers' Electric Company of New Orleans and the Houston (Tex.) Gas & Fuel Company. He also had under his supervision the auditing for the American Cities Company's properties, comprising six of the largest electric light and power companies in the South. After the termination of the United Gas & Electric Engineering Corporation's supervision, on account of the American Cities Company, the Birmingham Railway, Light & Power Company and other Southern properties going into a receiver's hands, Mr. Launey was continued as auditor of the Birmingham Railway, Light & Power Company until April 1, 1921, when, as stated above, he was appointed auditor of the Brooklyn Edison Company.

**E. W. Markle,** who had been connected with the educational and recreation work of the United States Army as principal and senior instructor of the electrical department, vocational schools, Camp Funston, Kan., has been appointed assistant professor of electrical engineering at the Agricultural and Mechanical College of Texas. Prior to his connection with the educational branch of the army, Mr. Markle was employed as instructor at the Kansas State Agricultural College. He is a graduate of Pennsylvania State College. His practical experience was gained with the Westinghouse Electrical & Manufacturing Company, East Pittsburgh, Pa.

**W. C. Minier** resigned as Pittsburgh district sales manager of the Shepard Electric Crane & Hoist Company, Montour Falls, N. Y., on Jan. 1. His successor is N. P. Farrar, formerly Baltimore district manager of the company.

**H. B. Marshall**, for thirteen years manager of the St. Louis branch of the Electric Storage Battery Company, has been placed in charge of all railway sales work of the company. Mr. Marshall, who will have his headquarters at the main plant in Philadelphia, has been connected with the company for the past sixteen years. He was graduated from the Armour School of Technology in 1905 and shortly afterward entered the employ of the Electric Storage Battery Company, taking a clerical position in the Chicago branch. He was appointed manager of the St. Louis branch in 1909. Mr. Marshall has devoted a great deal of attention to the question of use of batteries by all classes of railways and is well known in that field.

H. B. MARSHALL

**Edward Worcester**, vice-president in charge of sales, National Tube Company, Pittsburgh, resigned on Jan. 1. Mr. Worcester has been identified with the tubular-steel trade for more than thirty years and is well known in the industry. His first business connection was with the Chapman Valve Company, Boston, in 1870. In 1875 he became head salesman in the Chicago agency of the National Tube Works Company and later was connected with the sales force of the Walworth Manufacturing Company. During the period from 1882 to 1888 he was assistant secretary and secretary of the Crane Brothers Manufacturing Company, Chicago. At that time he became connected with the National Tube Works Company again and remained with the company, absorbed later by the United States Steel Corporation and renamed the National Tube Company, until the present time. Since 1903 he has been vice-president of the company in charge of sales. His place will be taken by John H. Nicholson, who has been vice-president in charge of operations of the seamless-tube plants of the National Tube Company.

**Thomas Lavier, Jr.**, formerly vice-president and chief engineer, has been made president of the Ray Battery Company, Ypsilanti, Mich.

**T. W. Frech** has been appointed general manager of the National Lamp Works of the General Electric Company. Mr. Frech's association with the National company began in 1901, when he left a position with the Western Electrical Instrument Company to become an assistant of F. S. Terry. There followed a year of production experience in the glass and lamp factories of the company. Later, during several periods, he was superintendent of the California Incandescnt Lamp Company, of the St. Louis factory, of the Cleveland factories on Forty-fifth Street and of the first tungsten-lamp factory. In 1906, when the tantalum lamp was developed in Europe, Mr. Frech went abroad with W. H. Roberts, and a year later, at the time of the development of the tungsten lamp, he went again, with J. E. Randall, to learn the process of making these lamps for the National interests. In 1910, when the process of drawing ductile tungsten was discovered, Mr. Frech was appointed to commercialize it for the National. Mr. Frech continued in the development work of drawn tungsten wire until 1913, when he became associated with the Peerless Motor Car Company, with which company he remained as vice-president and general manager until a few months ago.

**James R. Kearney**, formerly sales manager of the electrical division of W. N. Matthews & Brother, Inc., St. Louis, has been made vice-president in charge of sales of the electrical division, the appointment taking effect on Jan. 7. Mr. Kearney has been associated with W. N. Matthews & Brother, Inc., for seventeen years. Before becoming associated with them he was superintendent of construction of the Topeka (Kan.) Edison Company.

J. R. KEARNEY

## Obituary

**James Fairweather**, Philadelphia representative of the American Jobbers' Supply Company, died of heart disease on Jan. 11.

**Herbert S. Shaw**, treasurer and general manager of the Webster & Southbridge (Mass.) Gas & Electric Company, died recently. Mr. Shaw had been manager of this company for many years and was known as a man of vigorous personality, sound technical knowledge and progressive commercial attainments. He was a firm believer in the intensive development of territory served by local central-station companies and achieved noteworthy success by his independence of method. Mr. Shaw was one of the earlier managers to appreciate the value of cultivating summer residential business, and developments along this line under his direction attracted wide attention.

**William O. Fouch**, president of the Western Electric Works, Portland, Ore., died recently. Mr. Fouch was affectionately known among the fraternity as the father of the electrical contracting business in Oregon, and many of the successful men in all branches of the industry today commenced their electrical career under him. Mr. Fouch first came to Portland about 1888 from Illinois and immediately started in the electrical business during the days when electric gas lighting, doorbell wiring and repairing represented almost its entire field. About 1891 he entered into a partnership with O. B. Stubbs. This partnership continued under the firm name of the Western Electric Works until about 1910, when the partnership was dissolved and Mr. Fouch established a manufacturing business under the name of the old firm. This business he conducted with his son, E. M. Fouch, until the time of his death. Mr. Fouch was instrumental in organizing the first state association of electrical contractors in Oregon, serving as president of the organization on two different occasions for a period of years. He continued to be one of the most active members up to the time of his fatal illness. He was also president of the Manufacturers and Merchants' Association of Oregon. At the time of his death he had served the organization in this capacity for about three years. The passing of Mr. Fouch is sincerely mourned by a host of friends in the electrical business, all of whom have known him as a true friend, an honorable competitor and a man who stood four-square on every question.

# Trade and Market Conditions

**Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies**

## General Conditions Show Tinge of Improvement

THE basic industries of the country started the new year quietly but with enough business in sight to warrant the hope that the December average of improvement would hold good for the next few months. The building industry is the most fortunate, for, according to the F. W. Dodge Company, contemplated new work reported in 1921 amounted to $1,176,000,000, while only $647,000,000 worth of construction was actually started. This leaves a deficit of more than $500,000,000 worth of construction to go forward in 1922, in addition to which there will be an equally large proportion of work not yet reported. During the first two weeks of January the railroads placed many important equipment orders with the steel industry. Orders for 28,000 freight cars alone were placed, while the steel companies entered the year with orders for 500,000 tons of rails on their books and as much more in prospect. The oil, construction and automobile industries also have bought largely from the steel companies during these first two weeks. Copper mining has been partly resumed with the prospect of most of the larger mines being opened by April 1. Increases in employment have been reported by a large number of trades, including the machinery, electrical goods, wood products, paper-making and cutlery industries. There was a large decrease in employment in the food-products industry, but on the whole the industrial undertone shows much improvement over that existing in the fall and as this improvement has been very gradual it is felt that it is permanent.

## New Rigid Conduit Card Issued

MANUFACTURERS of rigid conduit have issued Card No. 49, which became effective Jan. 11 and superseded Card No. 48, issued on Sept. 16, 1921. Discounts have been increased eight points on conduit, ¼-in. to ½-in. galvanized conduit now being 47 per cent off list as against 39 per cent off under Card No. 48, and black pipe being 53 per cent off as against 45 per cent off formerly. It has been pointed out by one manufacturer, however, that, though discounts have increased, the price of conduit has actually increased from one-half of 1 per cent to 1 per cent, depending on size, through the discontinuance of several special discounts of 5 per cent each, which were not included on Card No. 48 but which have been in effect for some time. Another manufacturer stated that prices now were about 5 per cent lower than those put into effect Dec. 15, 1921. It is the general opinion, however, that the new card has been issued more as a step toward readjustment and stabilization of prices through the doing away with special discounts than as a move toward further liquidation. The steel industry, it is felt, has liquidated itself rather thoroughly, and with the issuance of the new card the rigid conduit market has been placed in a position to take advantage of the slightest upturn. The present discounts are the same as those in effect on Nov. 5, 1916.

Demand for rigid conduit has been somewhat quiet in the New York territory, but reports from New England, the Middle West and the Pacific Coast indicate good sales. Building there is going ahead rapidly, aided by the mildness of the season, and jobbers are carrying complete stocks, though not all of them have large stocks. Jobbers in New York and Chicago are carrying better stocks since the warehousing charge in those cities was raised. Some of the cards just issued give the warehousing charge as six points, but it is understood that for the time being the charge will remain four points, as announced recently.

## Collections Improve in East, but Change Little Elsewhere

COLLECTION and credit conditions are reported to have shown some improvement in New England and the East generally in the last thirty days. The opinion is expressed that this part of the country, the first to feel financial pressure, is also going to be the first to recover. New York jobbing houses have noted a gradual shortening of collections. Large accounts which have been outstanding for some time are being liquidated wholly or in part, new accounts still are being scrutinized carefully and current billings are on a thirty-day to sixty-day basis.

Reports from a number of leading jobbers in New England show a decidedly encouraging outlook there for collections at this time. Notwithstanding the pressure of income taxation levies during December, collections were unexpectedly good, and even the holiday buying in fields outside the electrical did not absorb enough funds to cause much inconvenience. In some cases the outstanding accounts receivable at the close of the year 1921 showed a better condition of affairs than a year ago. This is all the more encouraging in view of the fact that many retailers and wiring contractors made little if any money in 1921. Underlying improvement in financial conditions, the introduction of better business methods by contractor-dealers and an improved business outlook warrant the expectation that the new year will see better credit conditions than the one just ended. Following a recent collection period of seventy-five to eighty days, sixty days is now being taken for payments to the jobber in representative cases.

### Chicago Jobbers Find Conditions Fair

The credit situation in the Middle West has not changed materially, and present conditions among Chicago jobbers are fairly good. Collections are on an average of sixty days. Buyers either take advantage of the cash discount within the specified time limit or they wait the entire time allowed, thereby increasing the financial burden of the jobber. Conditions affecting the small out-of-town electrical dealer have not improved. Since he often depends upon the quick shipment of stocks from the jobbers' shelves to fill an order, he is hampered considerably when his purchaser cannot meet the bill within the set time of thirty or sixty days. Therefore, unless the electrical dealer has sufficient capital to tide himself over on a large shipment of goods, he is placed in a had financial position. Many large jobbers in Chicago expect that this winter will weed out many of these small dealers.

Credit conditions in St. Louis are declared to be about the same. One jobber reports poorer collections for the last few weeks, due chiefly to conditions in Oklahoma, where the small demand and low price for oil have had an adverse effect on general business conditions.

Liquidation of loans throughout the states covered by the Sixth Federal Reserve District has not progressed as well as was expected. The lagging in the price of cotton and its unstable condition has caused a great number of producers and others who have the staple on hand to withdraw from the market until the price recovers. This has had a tendency to reflect on all lines of industry, especially that of the electrical field. As an indication that

the low level has been reached as regards liquidation, statistics show that the number of commercial failures in this section was larger in the months of November and December than in any other months in 1921 and considerably larger than the same period of 1920. It is of interest to note that the volume of trade acceptances shows considerable decrease over the same period last year, and this is not due so much to a lack of popularity as to the fact that creditors during 1921 pressed their open accounts with greater vigor on a cash and thirty-day payment basis. Taking the situation as a whole, collections show a slight improvement over the same period of last year with less restriction to credit.

### PACIFIC COAST COLLECTIONS SLOW UP

Collections on the Pacific Coast have again slowed up, averaging from fifty-five to sixty days. Credit men are not only taking constructive steps to decrease this time to somewhere near last year's figure of forty-five to fifty days, but are also definitely asserting that offending firms which will not take similar constructive steps to improve their own collections and to act upon proffered suggestions along such lines will be dealt with summarily. The building strike of last summer induced many workers to go into business on their own account, particularly in the Oakland district, but as such men possessed limited capital and business experience they are gradually eliminating themselves.

## Germany Outshining United States in Spanish Market

DURING the first six months of 1921, according to figures just made public by the United States Department of Commerce, Germany shipped more electrical goods into Spain than did any other country, including the United States. This condition is just the reverse of that in the same period of 1920, when German electrical manufacturers were at the foot of the list. At that time Germany was just entering the Spanish market and large increases were to be expected, but at the present time the market for dynamos, motors, transformers, etc., seems to be dominated by the German manufacturer. No such large increase can be expected in the future, but, on the other hand, there is no reason to think that imports from Germany will drop while the Central European republi keeps down its labor cost by means of the depreciated mark.

Great Britain appears to command the Spanish market for electrical cables, although Germany and Belgium registered substantial gains, especially in conductors of the larger dimensions. Germany nearly quadrupled her sales of telephone and telegraph apparatus during the period in question, although Sweden is an important factor in this class. Imports from France and Sweden also show large gains. Sales of American electrical equipment about held their own—a very creditable showing in view of the large stocks of American goods already in Spain and the general uncertainty existing among importers who for some time have been stocked with American material purchased at high prices.

The accompanying table shows the imports of electrical goods into Spain from principal countries for the first six months of 1921, with the total values and corresponding figures for the same period in 1920.

IMPORTS OF ELECTRICAL GOODS INTO SPAIN

| Classes of Goods and Countries of Origin | January to June, 1920 Quantity, Kilos | Value, Pesetas(a) | January to June, 1921 Quantity, Kilos | Value, Pesetas |
|---|---|---|---|---|
| Dynamos, electromotors, induction coils, resistance boxes, transformers and regulators: | | | | |
| United States | 244,484 | ..... | 455,669 | ..... |
| Germany | 69,286 | ..... | 1,494,285 | ..... |
| Great Britain | 200,984 | ..... | 367,215 | ..... |
| Switzerland | 28,229 | ..... | 63,975 | ..... |
| France | 48,597 | ..... | 229,447 | ..... |
| Sweden | 9,657 | ..... | 86,657 | ..... |
| Other countries | 188,916 | ..... | 514,975 | ..... |
| Total | 829,673 | 3,149,379 | 3,203,213 | 12,380,118 |
| Electrical Cables: | | | | |
| United States | 75,848 | ..... | 14,092 | ..... |
| Great Britain | 95,427 | ..... | 93,709 | ..... |
| France | 7,857 | ..... | 27,751 | ..... |
| Germany | 221 | ..... | 69,059 | ..... |
| Belgium | ..... | ..... | 18,862 | ..... |
| Other countries | 14,950 | ..... | 25,258 | ..... |
| Total | 194,303 | 653,891 | 248,731 | 841,929 |

(a) Par value of the peseta is $0.193; exchange values for the first six months of 1921 averaged about $0.13.

## Platinum Rises 35 per Cent in Few Weeks

THE value of platinum has recovered considerably in the last several months, according to refiners of that metal. From the low mark of $65 per ounce of regular platinum, which occurred late last summer, the price has risen to $105 per ounce. Several weeks ago the metal was quoted at $78 per ounce, the present price being about 35 per cent higher than that. Quotations increased as much as $12 in one day during this period. Refiners attributed the advance in prices to a small supply and an increasing demand.

There have been few shipments from Russia, one of the largest platinum-producing countries, in the last few years on account of its unsettled economic and political condition, and dealers have had to depend on Colombia for the greater part of the supply. The metal is chiefly valuable to the electrical industry for use in instruments.

## Metal Market Situation

THE most important event that has taken place in the copper market in some time occurred on Jan. 16 with the resumption of operation of the mines of the Anaconda Copper Mining Company at Butte, Mont. The mines have been closed since last spring, and production on a large scale cannot be expected for several months. A production of 5,000,000 tons a month within thirty days is looked on as a reasonable start. With this producer active again discussion is concerned with the outlook in other districts. Calumet and Hecla, the largest producers in the lake region, will, according to report, reopen their mines about April 1. Now that a start has been made it is probable that practically all but the highest-cost mines will be opened within the next three months. The statistical position of copper could hardly be more propitious for the producer. The available surplus of the metal is now estimated as less than 450,000,000 lb., a figure which in the opinion of some leaders of the industry would presage a copper famine under normal conditions.

Present demand remains quiet both abroad and here. France and Germany have bought small amounts recently, but few other sales are heard of. Only one domestic order of any consequence has been noted recently, a large brass company having been in the market for second-quarter delivery. Prices of electrolytic copper for domestic consumption is 13⅜ cents per pound delivered for first quarter and 13⅞ to 14 cents for second quarter shipment.

NEW YORK METAL MARKET PRICES

| | Jan. 10, 1922 | Jan. 17, 1922 |
|---|---|---|
| Copper: | £ s. d. | £ s. d. |
| London, standard spot | 66 2 6 | 65 2 6 |
| | Cents per Pound | Cents per Pound |
| Prime Lake | 13.75–13.87½ | 13.75–13.87½ |
| Electrolytic | 13.62½ | 13.62½ |
| Casting | 13.00 | 13.00 |
| Wire, base | 15.00–15.25 | 15.00–15.25 |
| Lead, Am. S. & R. price | 4.70 | 4.70 |
| Antimony | 4.45 | 4.45 |
| Nickel, ingot | 41.00 | 41.00 |
| Sheet zinc, f.o.b. smelter | 8.50 | 8.50 |
| Zinc, spot | 5.12½–5.17½ | 5.07½ |
| Tin, straits | 32.37½ | 32.12½ |
| Aluminum, 98 to 99 per cent. | 19.10 | 19.10 |
| OLD METALS | | |
| Heavy copper and wire | 11.25–11.50 | 11.25–11.50 |
| Brass, heavy | 5.25 –5.37½ | 5.25– 5.37½ |
| Brass, light | 4.87½–5.00 | 4.50– 4.87½ |
| Lead, heavy | 4.00 –4.12½ | 4.00– 4.12½ |
| Zinc, old scrap | 2.50 –2.75 | 2.50– 2.62½ |

# THE WEEK
## IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

MORE or less uncertainty prevails as to how long it is going to take the electrical industry to get back into its pre-holiday stride. By this time annual inventories are almost all completed and replenishing of stocks should commence, but contrary to expectation hand-to-mouth buying still persists. Either stocks are not so low as was thought or retailers and jobbers have not regained full confidence.

Trade in New England is spotty with few changes of consequence. Lamp sales there are good with most other lines moving slowly. The event of the week in Chicago has been the support of the Landis building wage award by the rank and file of several of the unions affected. Business is still quiet and jobbers there are reported to have low stocks of metal molding. The word comes from Atlanta that the sale of electrical supplies salvaged from the United States Army cantonments in the South is hurting jobbers' business there. St. Louis jobbers report quiet business but a steady influx of inquiries for pole-line materials and motors. In the Northwest sales for the first two weeks of January are said to be ahead of those for the same period last year. There has been a slight readjustment of discounts on miniature lamps.

## NEW YORK

Business in the electrical trade has been somewhat spasmodic during the past week. Immediately after the first of the year quite a lot of after-inventory buying appeared which accounted for the rather unusual activity in this section. The jobbers feel well satisfied with present conditions, and the general sentiment is that business will show a very gradual but steady increase for the next two and a half months, when it will open up in earnest. Just at present price competition on some items is rather keen. There is, however, a fair demand for the general line of wiring supplies.

Prices remain about as last quoted. Announcement of a new discount card on rigid conduit was made by the manufacturers late last week. This, however, has had little if any effect on jobbers' quotations as the new prices are virtually the same as those arrived at by discounts on the previous card. Quotations on flexible armored conductor are a little easier this week as there appears to be a plentiful supply on the market.

Household appliances continue to move better than would naturally be expected after the holidays. Jobbers report that there has been an active demand for heaters of the reflector type. Stocks carried over from last year have been completely exhausted, and this, together with the lower prices which went into effect recently, have materially stimulated sales. Vacuum cleaners, in the popular-priced sizes, are moving steadily, and this appliance appears to be relatively as staple as the electric flatiron.

**Conduit.** — Jobbers' stocks are good and there is a moderate demand for the smaller sizes. Although the manufacturers issued a new discount card, No. 49, effective on Jan. 11, quotations remain virtually unchanged as additional discounts on Card 48 brought the net price down to the present figures. Quotations this week ranged as follows: For ½-in. black pipe in 2,500-ft. lots, $45 to $47; ¾-in., $58 to $59, and 1-in., $83 to $85 per 1,000-ft. Galvanized pipe in the same sizes and quantity was quoted at $50 to $51, $65 to $66 and $92 to $94 per 1,000 ft.

**Rubber-Covered Wire.**—Little change in conditions in the wire market was noted. Demand is moderate. No. 14 rubber-covered is quoted at $6.50 to $6.93 per 1,000 ft. in 5,000-ft. lots. Jobbers' stocks are good to large, and it is rumored that in some quarters orders for larger quantities than quoted here have been taken at a slightly lower figure.

**Flexible Armored Conductor.**—While the demand for this material continues very active, prices are somewhat easier and price cutting is in evidence. Quotations on No. 14, two-wire, single-strip, are from $43 to $45 per 1,000 ft. in that quantity. Double-strip is quoted from $45 to $47 per 1,000 ft. Jobbers' stocks are fair to good, and manufacturers are now well able to meet the demand.

**Lamp Cord.** — Jobbers' stocks are good to large, and demand is only fair. Prices remain as last quoted. No. 18, cotton, twisted, sells for $12.90 per 1,000 ft., and the parallel at $15.60 per 1,000 ft. in that quantity.

**Heaters.**—Sales of air heaters continue to be fairly active. Jobbers who carried over stocks of these appliances from last year report that they have all been disposed of and additional orders placed. The lower prices have apparently made sales much easier.

## CHICAGO

The dullness of the electrical trade due to the inventory season has continued another week, but a few jobbers report that business is better out in the suburbs than in Chicago itself. The opinion has been offered that some of this holding back in city business may be due to the unsettled building situation. During the week a group of unions, among them that of the electricians, refused to support the decision to strike and upheld the Landis wage award. This change of front among the rank and file of the unions has an important bearing on the proper settling of this controversy.

The total number of residential building permits in Chicago for 1921 was 10,870, an increase of 8,369 over 1920. Permits for new industrial plants reflected the slowing up of business since only 1,294 were issued in 1921, as compared with 1,426 during 1920. The total cost of all building permits had a value of $123,450,210 for 1921 as against $79,102,650 for 1920. Some of the big permits for 1921 were for the new Federal Reserve Bank building, the Illinois Merchants' building and the State Bank of Chicago.

**Wire.**—Several jobbers report a good out-of-town buying of wiring materials but only a fair movement to Chicago buyers. No. 14 rubber-covered wire has remained firm at $6.75 to $6.85 per 1,000 ft. in 5,000-ft. lots. Call for bare and weatherproof wire has not changed materially since last week and jobbers state that their stocks are ample. Bare wire still sells for 16¾ cents and weatherproof is quoted at 16¾ cents per pound in 1,000-lb. lots.

**Flexible Armored Conductor.**—Movement has been slow during the week, although a few jobbers report fair sales. No. 14, two-wire, double-strip, sells for $47 per 1,000 ft. in 5,000-ft. lots.

**Conduit.**—Movement on conduit has been spotty, although in a few cases some good orders have been obtained. Prices vary from $46 to $47 per 1,000 ft. in 5,000-ft. lots. Stocks are fair but not excessive.

**High-Tension Equipment.**—An order of fifty cut-outs for a central-station company in Massachusetts was delivered during the week by one manufacturer. Another company has received inquiries from central-station companies contemplating installation of new equipment.

**Wiring Material.** — Buying of this material has not changed much, although in a few cases it is found that the jobbers have placed some good orders. Considering the field as a whole, very few buying flurries have been discovered, dealers buying only in small lots. Key sockets list at $19.80 per 100 in standard-package lots of 500, while keyless sockets in the same quantity are quoted at $18 per 100. Pull sockets sell for $34 per 100 in lots of 250.

**Metal Molding.**—Stocks of most jobbers are low, since very little call for this material has been noted. The three-wire size sells for $56 per 1,000 ft. in lots of that quantity.

## BOSTON

Trade has been spotty during the past fortnight, with considerable delay in ordering for stock in retail circles resulting from inventory activities. Jobbers' stocks have been so well reduced in many lines that a very little increase in demand would almost at once be felt by manufacturers. The demand for wiring supplies is unusually dull this week, but in some places appliances are moving well and there is also an increased interest in motors. Lamp sales continue one of the brightest spots in trade. General business in New England has hardly got started for 1922, but the textile mills are pushing vigorously ahead on orders, and in the machine-tool field business is apparently held back chiefly by price uncertainties. Electrical prices have changed little this month thus far. Central-station business is decidedly better, and building operations reflected in New England contracts show marked improvement over this time last year. Contracts last week were the best in twenty years with one exception. For December the F. W. Dodge Company reports New England building and engineering contracts to have been 44 per cent better than a year ago. A marked increase in building is expected this year in the Northeast.

**Lamps.**—Exceptionally good business has been experienced for the past three months, and the trade is starting well this year. Discounts on miniature lamps have recently been modified. The garage man who buys 100 lamps now receives a discount of 33⅓ per cent off list instead of 40 per cent, and this gives the jobber a better opportunity to move his lamp stocks. Sign lighting is progressing well, and plenty of lamps of all standard sizes and types are to be had.

**Motors.**—Revived interest in motor propositions has appeared since Jan. 1, and several fair sales have been made. While pick-up business still dominates a somewhat unsteady market, the outlook is improved. Sharp competition is apparent in the second-hand market.

**Wire.**—Sluggish trade is the story of the New England insulated-wire market this week. Some cable production is under way in New England plants, but orders on jobbers are light. No. 14 rubber-covered wire sold Monday at $6.75 per 1,000 ft. in 5,000-ft. lots, and weatherproof base was steady at 16½ cents. Contractor-dealers are buying little wire during their inventory periods.

**Washers.**—A spurt of real activity has been taking place within the past fortnight among some of the more energetic central-station companies. No very active transfer of machines from dealers' stocks to the public is evident in the territory as a whole, but here and there vigorous commercial work is yielding its reward.

**Flexible Armored Conductor.**—This material has also been hit by the inventorial siesta which many contractor-dealers are indulging in. No. 14 single-strip is featureless at $47 per 1,000 ft., in 1,000-ft. lots.

**Knobs and Tubes.**—Light sales are taking place, with ample stocks to meet current requirements. "Nail-it" knobs are selling at $18.50 per 1,000 in barrel lots and 3-in. x ⅝-in. tubes at $6.20 per 1,000 in the same quantity.

**Socket Appliances.**—Vacuum cleaners are moving somewhat faster in retail circles. Table appliances are selling better than might have been anticipated after the December drives. Constant sales efforts are making their impression on the public in retail fields.

**Rigid Conduit.**—Prospects for moving this material are a bit better with the improving building outlook.

## ATLANTA

Judging from the decreased volume of business reported by jobbing firms, a great many dealers did not reduce stocks before inventory sufficiently to warrant immediate restocking, or else their purchases are on the hand-to-mouth basis and the volume of orders being received continues below normal. The size of individual orders is also reported to be decreased, thereby indicating hand-to-mouth purchases rather than restocking. The salvaging of electrical material in a number of government camps in the Southeast is having a depressing effect on the volume of sales, as this salvaged material is being placed on the market at prices far below market quotations. This situation will undoubtedly make itself felt for several months to come as the majority of the large government camps were in this section. While no spirit of pessimism is in evidence, nevertheless the opinion is generally expressed that no sharp resumption of sales can be expected until early spring. Engineering firms, however, hand in optimistic reports regarding inquiries looking toward developments and expansions to industrial plants.

**Steel Telephone Wire.**—A price reduction of 5 per cent is reported, effective this week, this reduction also applying to guy strand. The demand has slumped somewhat, while stocks are reported in excellent shape.

**Farm-Lighting Equipment.**—This line continues to show very satisfactory gains, both in sales and inquiries, due undoubtedly to sales campaigns being conducted throughout the district. Stocks in popular sizes are in fair to good condition and no price changes are anticipated.

**Panelboards.**—This line continues quite active, jobbers reporting satisfactory orders in a wide variety of sizes during the past two weeks. Shipments are satisfactory, varying from stock to six weeks. Prices are steady.

**Cross-Arms.**—Little activity among heavy purchasers is reported, but orders for small lots are reported quite satisfactory. A price advance of 10 per cent is effective this week. Stocks are in first-class condition.

**Safety Switches.**—Sales are very good, the 100-amp. and 200-amp. three-pole types being particularly popular. The 30-amp. entrance switch, of course, continues in steady demand. Stocks are somewhat spotty because of being reduced for inventory, but will be up to standard within the next ten days.

**Oil Switches.**—A fair movement of the standard types up to 2,300 volts and 200 amp. is to be noted, both the full automatic and the semi-automatic types being in demand. Local stocks are reported in fair condition.

**Telephone Equipment.**—An encouraging volume of inquiries is reported with sales averaging fair to good, most of the purchases calling for the less expensive equipment. Stocks are reported as quite heavy.

**Conduit.**—Little variation is to be noted, but the past few weeks have seen an increase in the proportion of purchases for the larger sizes of 2-in. to 4-in. No recent change in price is reported.

**Wiring Material.**—A rather lessened movement is in evidence, purchases being confined to small quantities for immediate requirements. There is no material change in prices and stocks are reported quite satisfactory.

## ST. LOUIS

The rejection by the carpenters of a reduction in wages from $1.25 to $1 per hour was a disappointment to those interested in furthering construction work in St. Louis. Although the carpenters are the only ones who have voted, their organization is about the largest of those in construction work, and it is anticipated that the other unions will be influenced in their votes by the carpenters' action. If the final result of all the elections in the Building Trades Council is against this reduction, efforts for compromise will probably be made, but many feel that spring will find the situation as it now stands. In the meantime construction work amounting to more than $20,000,000 is waiting only for lower costs.

The electrical jobbing business for the week was extremely quiet, almost every line being affected. However, if inquiries are any indication, improved business should soon be observed. Strong interest is being shown in pole-line materials, to some extent by the power companies but more particularly by the telephone companies. Numerous inquiries on motors are also received.

**Wire.**—Bare and weatherproof increased in price last week, while rubber-covered showed a tendency toward easier prices. The St. Louis base on both bare and weatherproof is 17 cents per pound. No. 14 rubber-covered, in

5,000-ft. lots, is quoted at $6.50 to $6.75 per 1,000 ft. Stocks have not changed much in volume for several months. Demand for the week was quiet, but quotations were being made on a large block of weatherproof.

**Wire Mold.**—The demand, except for the last two weeks, has continued to hold up well, and stocks, though low for a while, are now on a normal basis. The three-wire size is selling for $5.70 per 100 ft. and for $5.25 per 100 ft. in lots of 1,000 ft.

**Lock Nuts and Bushings.**—An advance of about 10 per cent is reported. The following prices are now quoted, each item being per 100 in lots over 100: ½-in. lock nuts, 60 cents; ½-in. bushings, $1.50; ¾-in. lock nuts, 85 cents, ¾-in. bushings, $2. Sales have been reasonably steady and stocks are in good shape.

**Dry Cells.**—Railroads are buying the regular cells in good quantities, and dealers are ordering ignition cells steadily, particularly those in sets. The regular is priced at 31 cents and the igniter at 32 cents, both in barrel lots. Stocks are in first-class condition.

**Motors.**—Sales remain sluggish, but inquiries received would indicate some resumption of demand in the next few months. The recent price reductions have stimulated interest. Stocks have a tendency toward heaviness.

**Condulets.**—The demand holds up well and is expected to show gradual improvement. Contractor stocks are very low, and jobber stocks are complete but not at all heavy. The prevailing discounts in standard packages, for one order and one delivery, are: Less than $15, 15 per cent; $15 to $100, 20 per cent; $100 and over, 28 per cent.

## SEATTLE—PORTLAND—SPOKANE

From all indications 1922 will probably be a very active year in construction throughout the Northwest. In Seattle contracts have already been let or permits issued for large business and office buildings which will cost about $2,000,000, and it is expected that this year will be the most active in building construction in the last decade. Several apartment houses and hotels are under construction or have been announced in Portland, and from Spokane comes report that buildings to cost about half a million dollars have been announced. It is reported also that several million dollars will be spent on highway construction around Spokane.

With a good domestic and export business in sight the lumber industry of the Northwest is preparing itself for a very good year. Production for the week ended Jan. 7 was 26 per cent below normal, while new business was 27 per cent below production and shipments were 10 per cent below production. It is understood that the railroads are setting aside funds for reconstruction during the coming year which will involve large purchases of lumber. Millions of bushels of grain are awaiting shipment from Portland as soon as the market can be opened up. The electrical business has been rather quiet since the passing of the holidays. In the retail trade the usual January sales are taking place. They are perhaps a little more conspicuous than usual and perhaps somewhat more prolonged as well. As a stimulus to buying they apparently are less successful today than a year ago. In common with other lines the electrical jobbers' business has likewise been somewhat slow, but this is natural for January. Business this January is somewhat better than it was a year ago. Country trade in various sections is reported reasonably active. There has been a slight lowering of prices in heating devices in some lines. Six-pound irons were reduced from $6.95 to $6.75. The reduction in headlight heaters amounted to about 10 per cent.

**Rubber-Covered Wire.**—Demand during the week was slow. Prices remain firm. Quotations are: No. 14, $7.40; No. 12, $9.80 per 1,000 ft. in 5,000-ft. lots.

**Ranges.**—Electric ranges are somewhat quieter than during December, but inquiries are active and it is expected that the demand will be active again within a short time. Prices installed range from $185 up, averaging about $210. Prevailing prices of ranges and wiring put them out of reach of many at the present time.

## SAN FRANCISCO

San Francisco building has not increased so tremendously as has that of Los Angeles. The gigantic construction plan promoted by the Chamber of Commerce and backed by all the leading business institutions is still virtually in the survey stage and has not yet begun to be more than dimly felt. It is a fact, however, that many of the long-standing gaps which were left in the downtown district after the fire of 1906 are now being steadily filled with large buildings.

**Fans.**—New contracts are now being mailed and road salesmen are actively soliciting the business. Last season was excellent for nearly all firms and carry-overs are low. The new prices average about 15 per cent decrease from those of last year with the burden of decrease borne by the larger desk sizes.

**Washers.**—Washer business has been rather slow, the bulk of the house-to-house solicitation being confined to vacuum cleaners because of their lower first cost. Prices, after some rather remarkable fluctuations, now appear steady, averaging from $130 to $140 for the family-size, swinging-wringer type.

**Lamps.**—Lamp conditions are normal, considerable attention being paid to the problem of reducing overhead handling charges. Probationary agents, for instance, have proved to be unsatisfactory in many cases because of their really limited outlet, and hereafter they must prove themselves capable of handling lamps to a value considerably larger than the value of their probationary contract. Further efforts will be made to reduce outstanding stock in the hands of agents. Agents' business is to be made more profitable by educating them to use the excellent advertising furnished them. Generally speaking, it may be said that the endeavor is not to find new outlets so much as to improve old ones.

## SALT LAKE CITY—DENVER

A summary of the past week in trade would show consumer demand generally at a low mark. Stock-clearance sales following inventory taking are the outstanding feature of merchandising. The public responds only indifferently to cut-price appeals. Meanwhile the stores are stocking well at prevailing prices preparatory to the spring trade. The electrical merchant is to some extent an exception. He will probably go on pursuing the policy of hand-to-mouth buying because of lack of capital to stock adequately. If trade should show a material improvement, he would find it necessary to buy about as much electrical merchandise as he sold.

Manufacturers of switchboard and other electrical materials that figure in construction report business exceedingly dull. In some plants they have found it necessary to operate on a four-day-week basis. There are many tentative building programs outlined, involving the ultimate expenditure of millions of dollars. The more important jobs will not be launched until there has been complete adjustment of disputes between employers and workers. Pole-line construction is practically at a standstill, and consequently there is scarcely any movement in pole-line hardware and wire, though prices are believed to have reached bottom. The growing use of electrical pump systems in irrigation is creating a demand for reduced power rates. The arrangements of a satisfactory schedule will probably rest with public utility commissions.

The National Wool Growers' Association has just closed an important annual convention at Salt Lake City. The big issue before the conference was the proposal to eliminate the present commission house as a link in the chain of marketing, the contention being that the growers could market co-operatively to much better advantage. The association went on record as favoring the change, though the wool industry is in a bad way. A rapid recovery is hoped for as a result of federal loan aid and the timely interest of Intermountain banks. There is a noticeable improvement in collections in nearly all lines of business. There is at the same time a lessened demand for money and few requests for renewals.

# Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

## Western Electric Sales 90 per Cent of 1920

Sales of the Western Electric Company for 1921 were approximately $185,000,000, a greater amount than in any previous year excepting 1920, when they totaled $206,000,000, according to a statement by Charles G. Dubois, president. The statement, discussing the outlook for 1922, estimated that the volume of business will be substantially the same as in 1921.

## Addition for Lincoln Company Plant

The Lincoln Manufacturing Company, 2630 Erskine Street, Detroit, manufacturer of lighting-fixture parts, is erecting a three-story addition, 30 ft. x 115 ft., adjacent to its present plant. When completed the addition will more than double the present output of the company and is to cost approximately $100,000. It is expected to have the new plant in operation by March 1. The company now manufactures popular-priced electric lighting fixtures, and it is intended to add to this a line of portable table lamps. Robert S. Aspinwall is president, Nathan Silberstein treasurer, Joseph Kahen vice-president.

For the last six months, according to Mr. Aspinwall, the plant has been working to full capacity with both a day shift and a night shift. There were enough orders on hand on January 1, he stated, to operate at capacity for two months.

## Phillips Announces Further Plans for Brockville Works

Further plans have been announced for the erection of the Brockville (Ontario) plant of the Eugene F. Phillips Electrical Works, for which the first contract was let recently as noted in the ELECTRICAL WORLD. A copper-rod rolling mill will be erected. At the present time there is no mill of this sort in operation in Canada. Contracts have been let for this building. Bids for the electrical equipment, which will include a substation for stepping current down from 44,000 volts to 2,200 volts and for a pumping station and equipment at an estimated cost of $300,000, are in, and it is expected that this work will go forward shortly.

The company, whose main plant and headquarters are at Montreal, has acquired a site of 132 acres at Brockville and has announced its intention of building a cable-manufacturing plant as soon as the rolling mill is finished. When business conditions warrant, according to Lawford Grant, managing director, the entire manufacturing end of the company will be moved to the Brockville site. The total plant and equipment when complete at Brockville, Mr. Grant stated, will cost in the neighborhood of $3,000,000.

## Worcester Wire Mills Busier

A gain in production is in evidence at the three Worcester (Mass.) plants of the American Steel & Wire Company according to a statement emanating from officials there. These plants are now operating on a basis of 55 to 60 per cent of normal and employing 5,000 persons, as compared with an average of 40 per cent for 1921. Most of the departments are running on a ten-hour day basis and are also working Saturday mornings. The cable department at the South Works is reported to be running on day and night shifts.

## Carmean to Have Pacific Coast Distribution

The Carmean Electric Company, Kansas City, Mo., has appointed Pacific Coast distributers to handle its motor-driven electric heaters. The California Electric Heating Company will have establishments in San Francisco and Los Angeles and, effective Feb. 1, will have charge of the distribution of Carmean products in California, Arizona, Nevada and Utah. The Goodman Electric Company, Tacoma, Wash., will distribute the company's products in Washington and Oregon.

W. H. Vance, vice-president of the Carmean company, will go through the Pacific Coast territory, starting Feb. 1, to investigate factory facilities there. The Pacific Coast and foreign business of the company, it is stated, is increasing rapidly, and the establishment of a branch factory in the West to supply this demand for the Carmean motor-driven electric heaters, is being considered.

## Supply Jobber Opens Long Island City Branch

The Starobin Electrical Supply Company, Twelfth Street at Fourth Avenue, New York City, has just opened a branch at 173 Hunter Avenue, Long Island City, N. Y. Besides stocking a general line of electrical supplies at this new address, Mr. Starobin has put in a stock of commercial and residential lighting fixtures on both properties, William Haag is in charge in Long Island City.

## Westinghouse Starts Work on Japanese Order

Work has been started at the East Pittsburgh plant of the Westinghouse Electric & Manufacturing Company on what is declared by the company to be the largest single transformer order ever placed. The order was received through Takata & Company, the Japanese agents of the Westinghouse company, from the Daido Electric Power Company. The contract calls for thirty-four transformers, averaging 9,400 kva. each, a total of 316,400 kva. They will be single-phase, 60-cycle, oil-insulated and water-cooled and will have a total high voltage of 154,000. Each will weigh approximately 50 tons installed. The equipment will be installed in a superpower system in the industrial district about Tokio. Eleven months will be needed to complete the order, the company states, at an estimated cost of $2,000,000.

## Anaconda to Increase Capacity of Great Falls Wire Mill

The Anaconda Copper Mining Company has announced plans for increasing the capacity of its large wire mill at Great Falls, Mont. The action is the result of the merger of the American Brass Company with the Anaconda company, and the Great Falls plant will operate virtually as an American Brass auxiliary. Thus the Western trade of the American Brass Company will be supplied with fabricated copper products from the Great Falls plant while the remainder of the business in these commodities will be taken care of by the Eastern plant.

The plan probably will go into effect in the near future as the merger of the two companies is in process of completion, more than 51 per cent of the total outstanding stock of the Brass company having been deposited in accordance with the Anaconda company's offer to purchase these shares.

## Lighting Fixture Convention and Market Plans Announced

Plans for the joint conventions of the National Council of Lighting Fixture Manufacturers and the Lighting Fixture Dealers' Society of America and for the "lighting fixture market," to be held in Milwaukee, Jan. 30 to Feb. 4, have been announced by the various organizations. Both the conventions and the fixture market will be held at the Milwaukee auditorium, registration starting on Monday, Jan. 30. The third annual meeting of the National Council of Lighting Fixture Manufacturers will have its first business session on Tuesday morning, at which the following topics among others will be discussed: "The Industry Seeing Iself," "What We Need Most," "Things We Should Throw Overboard" and "As Others See Us." At other business sessions will be discussed fixture design, design registration and means of making the industry

more profitable. The report of the standardization committee of the association is to be given on Friday morning, Feb. 3.

The convention of the Lighting Fixture Dealers' Society will be addressed by a number of speakers prominent in the industry, among them being M. H. Aylesworth, executive manager of the N. E. L. A.; P. S. Zimmerman, manager of the publicity department of the National Electric Lamp Association, and W. L. Goodwin, assistant to the president of the Society for Electrical Development. The questions of national advertising, costs and proper methods of cost accounting and co-operative publicity are some of the more important to be on the program for discussion.

The fixture market will be open from 2 p.m. until 6 p.m. each day to those connected with the industry and from 7 p.m. to 10 p.m. each day to the general public. A large attendance is expected at the conventions and market, reservations for display space being practically complete. Dealers from all parts of the country and even as far away as Hawaii have announced their intention to be represented at the dealer convention.

## Westinghouse International Sees Foreign Outlook Improving

The outlook for foreign business is encouraging, according to the Westinghouse International Company, which bases its optimism on inquiries running about 25 per cent greater than during the last quarter of 1921. Bookings of that company for 1921 exceeded those of 1920, when orders totaled approximately $14,000,000. As was the case with business during the past year, inquiries now seem mainly to cover railway electrification material.

## Kruse Electric Company Sells Manufacturing End

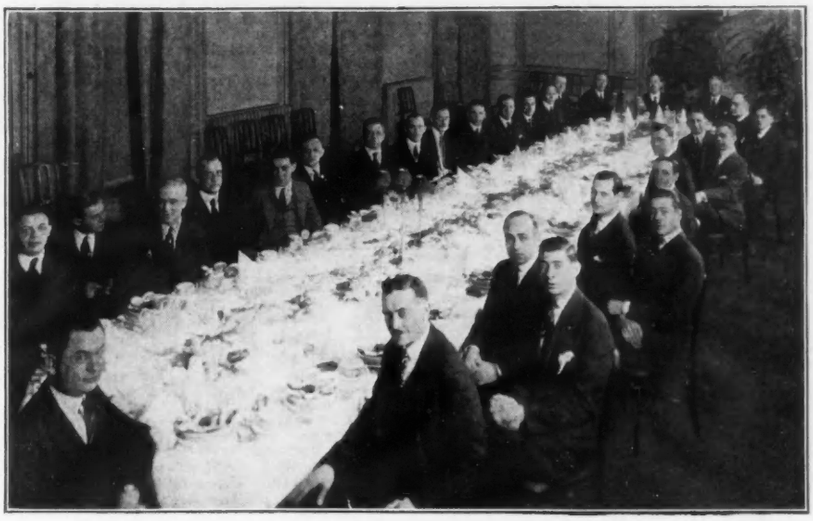
The Mid West Metal Products Company, Muncie, Ind., has taken over the manufacturing end of the Kruse Electric Company, Fort Wayne, Ind. The rights obtained by the Mid West company permit the manufacture of a patented switch-box supporting strip and lath holder. The plant of the Kruse company has been moved to Fort Wayne, and its successor has started production and distribution of the device. A. E. Wilson is sales manager of the Mid West company.

## Engineering Company Formed

A partnership under the firm name of Hudson & Myron has been formed to practice consulting engineering with offices at 808 Wabash Building, Pittsburgh, Pa. The partners are John P. Myron and Leo P. Hudson, who for the last fifteen years has been in private practice, working mainly on power plants, waterworks, valuations and rates. Mr. Myron was connected for seventeen years with the Pittsburgh Filter & Engineering Company as secretary and engineer.

## Sound Optimistic Note at Schimmel Sales Dinner

The electrical industry will perhaps overtop all others in its development during the year, according to speakers at the annual dinner given Jan. 6 to the sales organization of the Schimmel Electric Supply Company, Philadelphia. The speakers included William G. McKitterick, general sales manager National Lamp Works of the General Electric Company; William L. Goodwin, assistant to the president of the Society for Electrical Development; Harry Kirkland, vice-president American Wiremold Company; C. C. Skiles, sales manager Shelby Lamp Division, and Samuel Schimmel, president Schimmel Electric Supply Company. The dinner took place at the Hotel Adelphia.



ANNUAL GATHERING OF SCHIMMEL COMPANY SALES ORGANIZATION

The speakers pointed out that while the Eastern part of the United States has been rather slow along lines of electrical development, it is gradually catching up with the West. In the last six months of 1921 the electrical industry in the East made wonderful progress. This, it was predicted, will continue through 1922.

"Because of faith in the future," Mr. Schimmel said, "the Schimmel company has carried out a program of expansion. Because of faith in the future there are many new men with the company. This is an optimism of preparedness. We are gradually realizing the importance of readjustment, and as we realize it we are getting on a sounder basis. While we have not yet touched bottom, and in some instances may not for a while, we are getting more and more away from the inflated basis. This is true of every line and it is also true of the electrical line. I believe better days are coming. I do not believe, however, that a wave of insane buying is heading this way. I hope we are through with war and with its brand of prosperity."

Speaking of the work of the salesman in the coming year, Mr. Schimmel said the salesman of tomorrow would have to do more than merely take orders. He must render real service, know his customers, know their needs, their limits, their possibilities, and cater to all these. And, above all, Mr. Schimmel continued, he must be a persistent plugger.

**The Coffin Valve Company,** Boston, has appointed Theo. F. Dredge as Western representative, with offices in the Monadnock Building, San Francisco.

**The Quigley Furnace Specialties Company,** New York, has appointed the Federal Supply Company, Cleveland, as its sales representative.

**The Bleadon-Dun Company,** 213 South Peoria Street, Chicago, manufacturer of Violetta "Violet Ray" instruments, has moved its New York office to larger quarters at 47 West Thirty-Fourth Street. This office carries a large stock of all types of "Violet Ray" machines and is managed by M. H. Sarben, H. Burger and T. J. Voneschen.

**The Cutler-Hammer Manufacturing Company** has moved its New England sales office to larger quarters at 52 Chauncey Street, Boston. C. W. Yerger is manager.

**The Mechanical & Electrical Manufacturing Company,** Bethel, Me., has been organized to manufacture electrical products. The company is capitalized at $100,000. Theodore Morin is president.

**The Radio Manufacturing Company** has removed its general offices and sales department to 170 Fifth Avenue, New York.

**The Hall Kitchen King Company,** manufacturer of electrical kitchen equipment for hotels, has moved its offices and works to larger quarters at 1130-1134 Race Street, Philadelphia.

**The Kent Company, Inc.,** Rome, N. Y., has opened a New York office at 147 West Fifty-seventh Street. The office will be in charge of F. T. Kent. The company manufactures and sells the "Utility" electric floor machine, the Kent stationary cleaner and the "Vacuna" portable cleaner.

## Foreign Trade Notes

THE ELECTRIC LIGHT & POWER SUPPLY CORPORATION, LTD., Sydney, New South Wales, Australia, is issuing 143,900 new shares of capital stock of £1 each, the *Industrial Australian and Mining Standard* states, the proceeds to be used to provide funds for extensions to its distribution system, new substations, equipment, etc.

ELECTRIFICATION OF RAILROADS IN JAPAN.—The commission recently appointed by the Japanese government to consider electrification of the railroads in the country, according to reports in Japanese newspapers, has recommended as a first step electrification of over 2,000 miles of road. This is to include 186 miles of sections in suburbs where traffic is especially dense; 871 miles of sections having steep grades, where water power can be utilized; 146 miles where additional power is required to transport traffic that steam power has difficulty in moving, and 1,270 miles on other sections where electrical power can be used to better advantage than steam.

LOAN TO BERNE RAILWAY COMPANIES FOR ELECTRIFICATION.—Through a government loan plan, aid will be given for the electrification of the Berne railway lines, which are owned by private companies, according to a dispatch from the American Legation at Berne, Switzerland. The Department of Railroads, with the approval of the Federal Council, will submit to the Federal Chambers a request for a loan of 11,000,000 francs to be used for this electrification, which is in line with similar developments now being undertaken by the Swiss railroads.

CONCESSION FOR A TRAMWAY GRANTED IN INDIA.—The Dehra Dun-Mussoorie Electric Tramway Company, according to press reports, has been registered in India with the object of building a tramway between Dehra Dun and Mussoorie, for which a concession has been granted by the United Provinces government. The preliminary estimate of the cost of the work is 3,662,000 rupees. Further information can be obtained from the Electrical Equipment Division, Bureau of Foreign and Domestic Commerce, Washington, D. C., by referring to Miscellaneous Exhibit No. 229.

DEMAND FOR MOTORS IN CHINA.—Owing to extensive developments of industrial manufacturing projects in China, the *Commerce Reports* states, the demand for electric motors is expected to increase. The exports of motors to China during the last six months show that the market there for this class of apparatus has been steadier during the present world depression than that of perhaps any other foreign country. The following figures show the value of the United States exports of motors to China during the six months from May to October, 1921: May, $95,881; June, $59,410; July, $26,432; August, $77,791; September, $36,458; October, $47,646.

EXTENSION TO ELECTRIC SYSTEM AT SALFORD, ENGLAND.—Plans for a new electric generating station at Agecroft to supply electricity in Salford, according to *Electrical Industries*, have been approved by the Salford Town Council and the Electricity Commissioners. The cost of the proposed plant, including the installation of three electric generating sets and transmission cables to the Frederick Road station is estimated at £847,000.

ELECTRIFICATION OF CHILEAN RAILWAY.—Work in connection with the proposed electrification of the 233 track miles of the state lines between Santiago and Valparaiso and Llay Llay and Los Andes, Chile, according to *Electrical Industries*, will begin within the next sixty days. Overhead wires of the simple catenary type, supported on bracket arms, will be used. Electricity will be supplied by five substations beween Saniago and Valparaiso, with a total capacity of about 60,000 hp. Energy will be furnished at 3,000 volts, direct current, to operate the locomotives, of which there will be fifty-nine, ranging from 39 tons to 112 tons each.

BIDS FOR ELECTRIFICATION OF BRAZILIAN RAILWAY.—Bids will be received until March 30, according to *Commerce Reports*, for the electrification of the Central of Brazil Railway. The proposed work will include the erection of three or four substations, the first between Mangueira and Sao Francisco, the second near Deodoro, and the third or fourth between Deodoro and Belem; thirty locomotives will be required, ten for freight and twenty for passengers; for the suburbs sixty-six electric cars and 100 second-class box cars will be purchased; for the SS and SD trains there will be thirty-two electric cars and forty-eight box cars.

PROPOSED ELECTRIC POWER PROJECT IN INDIA.—A scheme to utilize the water power of two rivers in the neighborhood of Shillough for generating electricity for lighting and power purposes is under way, according to *Electrical Industries*. Influential parties are interested and the government is said to be considering the appointment of a board of industries.

## Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

A request has been received from a firm in Italy (No. 572) for general agencies from manufacturing companies for the sale of electrical supplies and machinery, electrical novelties, telephones and telephone supplies engineering supplies, etc.

A mercantile firm in Switzerland (No. 607) desires to purchase sanitary installations, such as baths, washstands and toilets; laundry and hot-water installations for electricity and gas, and small ice machines for household use.

## New Apparatus and Publications

TRANSFORMERS.—Bulletin No. 59 issued by the Sangamo Electric Company, Springfield, Ill., describes and illustrates the "Brooks" two-stage current transformers.

REFRACTORY LININGS.—"Hytempite in the Power Plant" is the title of a booklet published by the Quigley Furnace Specialties Company, Inc, 26 Cortlandt Street, New York City, dealing with refractory linings and the use of "Hytempite" in power plant work, as well as in connection with "Corbosand" for baffles, patching, boiler settings, etc. The booklet also gives some information on the uses of "Insulbrix."

OUTDOOR SUBSTATIONS.—The Delta-Star Electric Company, 2433-59 Fulton Street, Chicago, has issued bulletin No. 37, which contains sixty-four pages devoted to outdoor substations of all voltages up to and including 66,000 volts.

COMMERCIAL REGISTER.—The S. E. Hendricks Company, Inc., 2 West Thirteenth Street, New York City, has issued the 1922 edition of the Hendricks' "Commercial Register of the United States for Buyers and Sellers."

MOTOR.—A new-type ball-bearing "Norfolk" electric motor has been developed by Fred W. Walter, 215-217 Cumberland Street, Norfolk, Va., manufacturer of electrical machinery.

PORTABLE LAMP.—A new "Esrobert" boudoir lamp (No. 563) has recently been placed on the market by S. Robert Schwartz & Brother, 729-731 Broadway, New York City.

CIRCUIT BREAKERS.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh Pa., has placed on the market the type "F-11" line of oil circuit breakers. These are of moderate capacity, manually operated, non-automatic and automatic, with one, two and three trip coils.

TAKE-UP REELS.—The Hayward Company, 50 Church Street, New York City, is distributing pamphlet 620, covering the "Hayward" automatic cable take-up reel and a coupler which is designed for use with either a magnet or an electric bucket.

FUEL ECONOMY.—The Uehling Instrument Company 71 Broadway, New York City, combustion engineer, is distributing bulletin No. 220, entitled "Magnitude of the Power Plant's Chimney Loss," and bulletin No 221, entitled "Relation Between $CO_2$ and Money Wasted Up the Chimney," in which it explains the loss in the combustion of fuel for industrial purposes and gives tables and curves showing same.

SHAFT COUPLINGS.—An improved type of the "Bartlett" flexible shaft coupling is being placed on the market by C. H. Breaker, general sales agent, 4226 Broadway, Indianapolis, Ind.

STEAM CONDENSING PLANTS.—The Ingersoll-Rand Company, 11 Broadway, New York City, is distributing a booklet entitled "Steam Condensing Plants," covering surface condensing plants and describing a new type of condenser developed by the company.

REFLECTOR SOCKET.—Descriptive leaflet 3443 issued by the Westinghouse Electric & Manufacturing Company, Pittsburgh, describes the "Cutter" luminous-top holder-socket reflector.

COMMUTATOR RESURFACERS.—The Ideal Commutator Dresser Company, 3229-31 Sheffield Avenue, Chicago, is distributing a two-page leaflet describing the "Ideal" commutator resurfacers.

CONDUIT AND CONDUIT BODIES.—The Sprague Electric Works of the General Electric Company, 527-531 West Thirty-fourth Street, New York City, are distributing two leaflets, one describing the "Greenfield Duct" conduit and the other the "Spraguelets" conduit bodies for exposed wiring.

OUTLETS.—The Merrill Company, Ipswich, Mass., manufacturer of electrical specialties, is distributing a leaflet describing and illustrating the "Merrico" outlets.

SEARCHLIGHT.—The "Excellight" searchlight used in tanks and motor transports during the recent war is now manufactured by the National Marine Lamp Company, Forestville, Conn.

BOXES.—The Electric Motor & Engineering Company, Canton, Ohio, manufacturer of power equipment specialties, switchboards, etc., is distributing price sheets pertaining to its third catalog, covering steel boxes for all electrical purposes.

FUSES.—The Bowie Switch Company, Nevada Bank Building, San Francisco, is distributing bulletin No. 14, describing the Bowie expulsion-tube fuses.

ROCK DRILL MOUNTING.—The General Electric Company, Rock Drill Department, Fort Wayne, Ind., is distributing a four-page circular describing its boom mounting for the Fort Wayne electric rock drill for installation on mine cars.

WIRE ROPE.—"Outspinning the Spider" is the title of a book issued by the John A. Roebling Sons Company, Trenton, N. J., giving a history of wire-rope making in this country from the beginning of the industry here in 1840. It also contains a description of the Brooklyn Bridge and of the wire-rope barrage laid down in the English Channel during the World War and of other engineering achievements.

LIGHTING FIXTURES.—The Herwig Art Shade & Lamp Company, 2140 North Halsted Street Chicago, has placed on the market an outdoor lighting fixture made entirely of cast metal for a 10-in. or a 12-in. globe.

TOASTER.—The Century Manufacturing Company, Inc., Elizabethtown, Pa., is marketing an electric toaster which will toast two pieces of bread on both sides at the same time.

SAFETY SWITCH.—The S. R. Fralick & Company, 15 South Clinton Street, Chicago, is manufacturing a new medium-priced safety switch rated at 30 amp., 125 volts.

## New Incorporations

THE FORT ELECTRIC COMPANY OF HANCOCK COUNTY, Greenfield Ind., has been incorporated with a capital stock of $125,000 to furnish electricity for lighting purposes. The directors of the company are George W. Coffman, Edward S. Fort and Robert D Glazer.

THE AKRON (OHIO) ELECTRICAL MANUFACTURING COMPANY has been incorporated with a capital stock of $10,000 by Harry A. Miller and Harry Slosower.

THE TROJAN ELECTRIC COMPANY, Troy, N. Y., has been incorporated with a capital stock of $10,000 by Leland M. Surdan, Hoosick Falls, N. Y.; George D. Zinck, Irvington, N. J., and Joseph W. Flynn, Newark, N. J.

THE LORRAINE (N. Y.) ELECTRIC COMPANY has been incorporated with a capital stock of $5,000 by O. W. Tucker, O. L. Smelmidine and C. A. Caulkins.

THE FRASER ELECTRIC LIGHT COMPANY, Boone, Ia., has been incorporated with a capital stock of $10,000. The officers are: C. H. Henle, president, and F. A. Cascotti, secretary and treasurer.

# Record of Electrical Patents

**Notes on United States Patents**

(Issued Dec. 20, 1921)

1,400,959. PROCESS AND APPARATUS FOR CARRYING OUT CHEMICAL REACTIONS BY CATALYSIS; Joseph Koetschet, Lyons, France. App. filed April 26, 1919.

1,400,988. PRINTING TELEGRAPH; Foster Ritchie, Earling, England. App. filed Aug. 6, 1918. For two-wire telegraph or telephone line.

1,401,016. COMMUTATOR AND THE LIKE; Rene A. L. Volet, Paris, France. App. filed Oct. 6, 1920. Wires attached in eyelet formed by bending riser of bar.

1,401,021. SWITCHING BOX; Paul F. Williams, Chicago, Ill. App. filed Feb. 1, 1918. For underground cables.

1,401,035. GAS GENERATOR; Martin Boisen, Sandusky, Ohio. App. filed March 19, 1921. Generates oxygen and hydrogen and passes gases through separate outlets.

1,401,049. REGULATING DEVICE FOR DYNAMO-ELECTRIC MACHINES; Oliver F. Conklin, Detroit, Mich. App. filed July 10, 1917. Regulates current output of electric machines.

1,401,087. SILENT ELECTRIC SIGNAL FOR BANKS; George W. Lancaster, Richmond, Va. App. filed Nov. 23, 1916. Silent signal from bookkeeper to teller.

1,401,112. DYNAMO-ELECTRIC MACHINE; Alvin E. Buchenberg, Toledo, Ohio. App. filed June 25, 1917. Distortion of field flux reduced to a minimum.

(Issued Dec. 27, 1921)

1,401,121. MOUNTING FOR VACUUM TUBES; Roy M. Allen, East Orange, N. J. App. filed May 24, 1918. Sponge-rubber base.

1,401,186. ELECTRIC RESISTANCE UNIT; Herman F. Frenzlow, Johnson Creek, Wis. App. filed April 12, 1920. Terminals of the heat unit close together.

1,401,217. SWITCHBOARD PLUG; Alfred H. Weiss, Wilmette, Ill. App. filed May 17, 1918. Split ring to hold protective sleeve.

1,401,276. PULL SWITCH; Arvid H. Nero, New Britain, Conn. App. filed Feb. 12, 1919. Quick break.

1,401,387. SYSTEM OF MOTOR CONTROL; Charles H. Allen, Chicago, Ill. App. filed April 1, 1918. For reversing washing-machine cylinders.

1,401,447. ELECTRIC SIDE-WALL HEATER; Oliver P. Scott, Tacoma, Wash. App. filed May 5, 1921. Installed between studding of wall.

1,401,448. METHOD OF JOINING PLATES OR THE LIKE; Thomas J. Shea, Portland, Ore. App. filed Feb. 5, 1921. By electric welding.

1,401,451. CAR-LIGHTING SYSTEM; Leonard A. Watson, Sound Beach, Conn. App. filed Nov. 27, 1920. Regulates voltage of axle-driven generator.

1,401,472. ELECTRIC HEATER; John E. C. Holmes, Ottawa, Ontario, Can. App. filed Sept. 22, 1920. Combined with water receptacle to diffuse humidity.

1,401,477. RESISTANCE UNIT; Leonard Kebler, Bronxville, N. Y. App. filed Feb. 15, 1919. Terminals permit handling without breaking enamel.

1,401,492. REGULATING DEVICE FOR DYNAMO-ELECTRIC MACHINES; James B. Replogle, Detroit, Mich. App. filed Aug. 18, 1917. Machine driven at variable speeds.

1,401,493. INDUCTION COIL; James B. Replogle, Detroit, Mich. App. filed June 13, 1919. Two magnetic circuits, each provided with an air gap.

1,401,495. TROLLEY WHEEL; Samuel S. Rigby, New Castle, Pa. App. filed Oct. 24, 1921. Guard against dislodgment.

1,401,500. ELECTRIC HEATER; Oliver P. Scott, Tacoma, Wash. App. filed Oct. 17, 1919. For air or water.

1,401,510. ELECTRIC GLOW LAMP; Heinrich Baumhauer, Charlottenburg, Germany. App. filed Nov. 13, 1917. Lamp filled with argon.

1,401,531. CABLE AND TELEPHONE-WIRE CONTAINING RAIL; Frank Gaspar, Cupar, Saskatchewan, Can. App. filed Sept. 1, 1921. Third-rail telephone for trains.

1,401,544. TELEPHONE EXCHANGE SYSTEM; George A. E. Lundell, Chicago, Ill. App. filed Nov. 1, 1919. Order circuit for operators.

1,401,548. ELECTRIC MOTOR; Thomas J. Murphy, Rochester, N. Y. App. filed Sept. 17, 1917. Aligning of armature and field elements.

1,401,564. TETRAHEDRONAL MAGNETIC UNIT; James B. Speed, New York, N. Y. App. filed Sept. 3, 1918. Loading unit for six related telephone circuits.

1,401,573. BATTERY POST AND METHOD OF MAKING A SEAL; Harry L. Wood, Lakewood, Ohio. App. filed March 21, 1921. For storage batteries.

1,401,586. ELECTRICAL SEARCHING COIL; Archie R. Comstock, Mount Kisco, N. Y. App. filed Jan. 24, 1920. To locate trouble in wire communication systems.

1,401,592. DEVICE FOR ELECTRICALLY HEATING HAND IRONS; David Donaldson, Leith, Scotland. App. filed Sept. 16, 1920.

1,401,596. LIGHTNING ARRESTER; Edward A. Everett, Long Island City, N. Y. App. filed Sept. 15, 1920. For telegraph lines.

1,401,627. TESTING DEVICE; Jesse E. Mateer and Chester T. Allcutt, Wilkinsburg, Pa. App. filed Sept. 1, 1917. For the insulating properties of oils.

1,401,638. MOTOR-CONTROL SYSTEM; Fred M. Parks, Murrysville, Pa. App. filed Feb. 13, 1920. To control the speed and direction of operation of motors.

1,401,644. METHOD OF AND APPARATUS FOR AMPLIFICATION OF SMALL CURRENTS; Chester W. Rice, Schenectady, N. Y. App. filed July 31, 1917. Radio tube amplifies in cascade.

1,401,645. CONTROL APPARATUS; Lynn G. Riley, Wilkinsburg, Pa. App. filed June 15, 1917. For motor-reversing switches of the power-operated drum type.

1,401,650. TROLLEY HANGER; William Schaake, Pittsburgh, Pa. App. filed May 7, 1917. For two wires.

1,401,654. MEASURING SYSTEM; Francis H. Shepard, New Rochelle, N. Y. App. filed July 10, 1918. Frequency meter indicating small changes in frequency.

1,401,657. ELECTRIC HEATING UNIT; Frank Thornton, Jr., Mansfield, Ohio. App. filed Dec. 2, 1918.

1,401,671. EMERGENCY SOURCE OF VOLTAGE; Lewis W. Chubb, Edgewood Park, Pa. App. filed Dec. 14, 1918. Galvanopile associated with deliquescent substances maintained in a dry state by vacuum.

1,401,673. INDUCTION HEATER; Ora A. Colby, Irwin, Pa. App. filed Feb. 25, 1919. Heat generated in liquid-carrying passage.

1,401,674. ELECTRIC GLASS-ANNEALING FURNACE; Ora A. Colby, Irwin, Pa. App. filed April 7, 1920. Plurality of spaced chambers, with resistor for each.

1,401,676. STORAGE BATTERY; Henry Csanyi, New York, N. Y. App. filed May 12, 1919. Primary cell with electrolyte between depolarizing material and case.

1,401,678. APPARATUS FOR NITROGEN FIXATION; F. Darlington, New York, N. Y. App. filed Nov. 23, 1917. Furnace for carrying out catalytic action.

1,401,679. BRUSH HOLDER; Dudley F. Dillin, North Canton, Ohio. App. filed Feb. 11, 1920. With detachable pigtail.

1,401,682. ELECTRICAL DISTRIBUTING SYSTEM; Giuseppe Faccioli, Pittsfield, Mass. App. filed Nov. 26, 1920. To control load on circuits.

1,401,685. PROTECTIVE DEVICE; Paul R. Fortin, Schenectady, N. Y. App. filed Oct. 21, 1919. Relay to open unbalanced circuits.

1,401,686. ELECTRIC HEATING DEVICE FOR PLUNGING; Fritz Frei, Berne, Switzerland. App. filed Oct. 16, 1920. Used directly in food dish.

1,401,688. ELECTRIC WAFFLE IRON; Frank F. Forshee, Flint, Mich. App. filed Jan. 30, 1920. Means for carrying and turning.

1,401,697. COMMUTATING-POLE CONSTRUCTION; Philip E. Henninger, Edgewood Park, Pa. App. filed July 25, 1918. To secure large surface.

1,401,708. COMMUTATOR CYLINDER; Willard H. Kempton, Wilkinsburg, Pa. App. filed May 28, 1919. Held together by molded rings of non-conducting material.

1,401,753. TELEPHONE RECEIVER; G. Boissonnault, Hewlett, N. Y. App. filed Jan. 29, 1921. Loud speaking for wireless.

# Construction News

**Projects, Plans, Bids and Contracts Contemplated or Under Way**

## New England States

BENTON, ME.—Plans are under consideration by the United Paperboard Company, Benton, for the construction of a 2,500-hp. hydro-electric plant below the dam of the Benton Falls mill of the company. H. R. Kimball is superintendent of the Benton Falls mill.

SOUTH PORTLAND, ME.—The Cumberland County Power & Light Company, Portland, has plans under way for the construction of an auxiliary power station on the site of the old dry docks in South Portland, on Casco Bay.

WINDHAM, ME.—The Windham Manufacturing Company is having plans prepared for the construction of a one-story power plant, to cost about $40,000. A. P. Safford, 66 Broadway, Lowell Mass., is engineer.

CAMBRIDGE, MASS.—Work will be started shortly by the Cambridge Electric Light Company on the construction of a switch house, 90 ft. x 140 ft., near the Blackstone Street generating station of the company. All regulators and switching equipment for this installation have been purchased, the total cost of the project being $450,000, with an outlay to date of approximately $175,000. Welles E. Holmes, treasurer and general manager of the company, informed the ELECTRICAL WORLD that the new installation will be designed to handle 40,000 kw. at 6,600/2,200 volts, and the bus structure will be designed for an ultimate service of about 75,000 kw. in case the company should decide in the future to interconnect its system with others in the eastern Massachusetts network. All switching equipment will be removed from the generating plant to the new structure and about $280,000 will be expended in construction and cable work.

CAMBRIDGE, MASS.—A petition has been submitted to the City Council by citizens of Cambridge requesting the removal of all poles and placing of wires underground.

LOWELL, MASS.—A movement has been started for extensions to the ornamental lighting system. Edward W. Trull is clerk of the district court.

STRATFORD, CONN.—Plans are under way by Hollander Brothers, manufacturer of metal products, 360 George Street, Bridgeport, for the construction of a new three-story factory, 50 ft. x 100 ft., at Stratford. A one-story power house, 25 ft. x 35 ft., will also be built. Davis & Dane, Bridgeport, are architects.

THOMPSONVILLE, CONN.—The committee from the Board of Trade in charge of investigations for an ornamental lighting system in the business district has decided to investigate the cost of including in the lighting plan Franklin, Pearl and Main Streets from Furey's Corner in Enfield Street to the depot, and also North Main Street from the waiting station to Alden's Corner in Enfield Street. Mark W. Bushnell is chairman.

## Middle Atlantic States

BUFFALO, N. Y.—The National Biscuit Company, Tenth Avenue and Fifteenth Street, New York City, contemplates the construction of a power plant in connection with its new plant at 217 Ellicott Street, Buffalo, for which foundation work has been started. The entire project, including machine shop and automobile service building, will cost about $1,000,000.

ENDICOTT, N. Y.—Arrangements are being made by the Binghamton Light, Heat & Power Company for the extension of its electric distribution lines into a new territory west of the village of Endicott and adjoining and south of the village of West Endicott.

SYRACUSE, N. Y.—The board of directors of the Crouse-Irving Hospital, 720 South Crouse Avenue, is considering the construction of a new power house.

WAPPINGERS FALLS, N. Y.—The directors of the Wappingers Electric Corporation have authorized the installation of

a new set of waterwheels during the coming summer. The waterwheel now in use is in a closed casing and is operated under a pressure head varying from 55 ft. to 64 ft. and a draft of from 17 ft. to 20 ft. The company is also making considerable extensions to its pole line. Orville M. Whitehouse is president.

MAYS LANDING, N. J.—The construction of an electric and gas plant in Mays Landing, to be financed by Philadelphia capitalists headed by William Rosenbach, is reported to be under consideration. W. M. Leslie is president of the Chamber of Commerce.

DANVILLE, PA.—Plans are under way by the board of directors of the Danville (Pa.) State Hospital for the construction of a one-story power house, 50 ft. x 250 ft. F. Arthur Rianhard, Masonic Temple Building, Williamsport, is architect. William F. Shay, Watsontown, is president of the board.

POTTSVILLE, PA. — The Phillips-Jones Corporation has had plans prepared for the construction of a one-story power house, 50 ft. x 50 ft., at its plant.

SPRING GROVE, PA.—The P. H. Glatfelter Company is planning the installation of electric generating machinery, motors, paper-mill machinery and other equipment in connection with additions to its paper mill.

WILLIAMSPORT, PA.—Plans are under consideration by H. A. Moore, 114 Elm Street, Milton, for the construction of a two-story warehouse, supply shop and power house at Franklin and Fourth Streets in Williamsport. The cost is estimated at $50,000.

CHARLESTON, W. VA.—Plans are under consideration by the Stone Cliff Collieries Company, recently organized with a capital stock of $25,000, for the installation of electrical and other machinery at its properties. C. A. Brockman is president and manager.

FAIRFAX, VA.—The Fairfax & Loudon Light & Power Company, Fairfax, recently organized with a capital stock of $100,000, is planning extensions to its system, including the erection of a 23-mile transmission line connecting Fairfax, Vienna and Herndon. Other extensions are contemplated later on. Electricity will be purchased from the Alexandria County Lighting Company, Alexandria. The cost of the extensions is estimated at $60,000. Thomas R. Keith is president of the new company.

WASHINGTON, D. C.—Plans have been completed by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for the installation of a motor-generator set and switchboard at submarine base. Applications accompanied by a deposit of $10 may now be filed for plans and specifications (4570), and necessary data for bidding will be forwarded in the near future. All communications should be addressed to the chief of the Bureau of Yards and Docks.

WASHINGTON, D. C. — Separate bids will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until Jan. 26 for the installation of an ice-manufacturing and refrigerating plant in the United States Treasury Building at Washington, D. C. James A. Wetmore is acting supervising architect.

## North Central States

HUDSONVILLE, MICH.—Business men of Hudsonville are reported to be negotiating with the Consumers' Power Company, Grand Rapids, for extension of the company's line to Hudsonville. The nearest connection is 5 miles away.

OTSEGO, MICH.—The MacSimBar Paper Company has awarded contract to H. L. Vanderhorst, Kalamazoo, for the construction of a new power plant, to cost, including equipment, about $350,000.

CLEVELAND, OHIO.—The City Council has passed an ordinance providing for an expenditure of $100,000 for the erection of police stations and the purchase of cable and other apparatus and instruments for extensions to the police signal system.

GENOA, OHIO.—The United States Gypsum Company has construction under way on six additional lime kilns at its local plant and plans to install equipment for electrical operation. Electricity will be furnished by the Northwestern Ohio Railway & Power Company, Toledo.

LAKESIDE, OHIO.—The Kelley Island Lime & Transport Company has work under way on the construction of a new crusher plant at Lakeside, to have a capacity of 1,000 tons per hour. The Northwestern Ohio Railway & Power Company, Toledo, will furnish 1,500 hp. for electrical operation of the new plant.

PORT CLINTON, OHIO. — The White City Beach Company has been granted a franchise by the Ottawa County Commissioners to erect a transmission line for the purpose of supplying electricity for light and power on Catawba Island.

BLOOMINGTON, IND. — The Showers Brothers Company is contemplating the construction of a one-story power plant in connection with the proposed addition to its present plant. The H. K. Ferguson Company, Vickers Building, Cleveland, Ohio, is architect. Charles A. Sears is superintendent.

COUDERAY, WIS.—Contract has been awarded to the Meyers Construction Company of Oshkosh for the construction of a large dam across the Chippewa River, 12 miles northeast of Couderay. The project is backed by the Minnesota-Wisconsin Light & Power Company, Eau Claire. The cost of the construction of the dam and the flowage will be shared equally by all the power concerns along the Chippewa River that will be benefited by the reservoir the dam will make. It will be known as the Pa Kwa Wang reservoir and will cover about 24,000 acres.

MADISON, WIS.—Improvements to be made by the Madison Gas & Electric Company during 1922, including additions to its plants, extensions to its lines and mains, are estimated to cost approximately $365,000. John St. John is vice-president and general manager.

MILWAUKEE, WIS.—An election will be held in the spring for the purpose of submitting to the voters the proposal to issue $200,000 in bonds for extensions to the street-lighting system. G. Staal is city engineer.

PLYMOUTH, WIS.—Most of the machinery and equipment including power-plant machinery, in the building of the Badger Cabinet Company was recently destroyed by fire, causing a loss of about $60,000. The company, it is understood, plans to build a fireproof factory early in the spring. George Brickbauer is president.

SHEBOYGAN, WIS.—The H. C. Prange Company, Eighth and Wisconsin Avenue, is planning the construction of a four-story power house and heating plant on Eighth Street to cost between $150,000 and $175,000.

KANSAS CITY, MO.—Plans are being prepared by S. S. Joy, architect, 2001 West Thirty-ninth Street, Chicago, Ill., for the construction of an eight-story cold-storage and ice plant, 150 ft. x 300 ft., in Kansas City, to cost about $1,000,000. The owner's name has been withheld.

ST. LOUIS, MO.—The Missouri Athletic Association is having plans prepared for the construction of a six-story service building, including power plant, at Fourth and Washington Streets, to cost about $150,000. G. F. A. Bruggeman, Liberty Central Bank, is architect. W. C. Boering, 407 Washington Avenue, is president.

HAMILTON, KAN. — The City Council contemplates the construction of a municipal waterworks and electric light system, for which bonds have been authorized. The project includes the erection of an 11-mile high-tension transmission line and a 4-mile low-tension line, outside substation, etc. F. E. Devlin, Eldorado, is engineer.

## Southern States

BURLINGTON, N. C.—Eugene Holt is considering the installation of an electric light and power system.

RALEIGH, N. C.—Plans are being prepared by the board of directors of the State Hospital in Raleigh for the construction of a new one-story and two-story ice and refrigerating plant. H. A. Underwood, Raleigh, is engineer. Dr. Albert Anderson is superintendent.

COLUMBIA, TENN. — The Columbia Water & Light Company is considering improvements and extensions to its electric service.

ALTUS, OKLA. — At a special election held recently, bonds to the amount of $150,000 were authorized for the construction of a municipal electric light and power plant in Altus.

OKEENE, OKLA.—The City Council is considering extensions to the municipal electric light plant involving an expenditure of about $40,000. Equipment, including engine, generators, motors, pump, switchboard, wire and pipe, will be required.

WOODWARD, OKLA.—Black & Veatch, architects, Mutual Building, Kansas City, Mo., have been engaged to prepare plans for the construction of a municipal electric light and power plant, to cost about $100,000.

DENISON, TEX.—Plans are under consideration by the Missouri, Kansas & Texas Railway Company, St. Louis, Mo., for improvements and extensions at Denison, including new engine house, power plant, machine and repair shops, etc. The cost of the work is estimated at more than $2,000,000.

LIVINGSTON, TEX.—The local electric light and power plant is reported to have been damaged by fire.

## Pacific and Mountain States

SPOKANE, WASH.—Arrangements have been made by the Washington Water Power Company for making a survey for a proposed extension to its electric transmission lines into the country between Ephrate and Stratford in Grant County. The present plans provide for 50 miles of high-tension lines and from 50 to 60 miles of feeder lines.

VANCOUVER, WASH.—The Lewis River Hydro-Electric Power Company, Vancouver, has applied to the City Council for a fifty-year franchise to furnish electricity for light and power, and eventually to supply water.

FRESNO, CAL.—Application has been made by the San Joaquin Light & Power Corporation to the Railroad Commission for permission to issue $5,000,000 in stock, the proceeds to be used for proposed hydro-electric development and extensions to its electric distribution and transmission lines.

MERCED, CAL.—Plans have been adopted by the City Trustees for the installation of an ornamental lighting system consisting of 455 electroliers, for which, it is understood, bids will soon be asked.

SAN DIEGO, CAL. — Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Feb. 2 for cold-storage and refrigerating equipment at San Diego, Cal. (Specification 4543.)

SAN FRANCISCO, CAL.—Specifications are being prepared for waterwheels, transformers and pressure pipes for the Hetch Hetchy power plant near Priest Portal and the Early intake, where it is expected to erect the power house in connection with the Hetch Hetchy water project. M. M. O'Shaughnessy is city engineer.

## Canada

WEST VANCOUVER, B. C.—The Council is considering the construction of a 350-hp. hydro-electric plant at Cypress Creek, to cost about $90,000.

MONCTON, N. B.—Representatives of the Canadian National Railways Company, Toronto, Ont., and the Moncton (N. B.) Tramways, Electric & Gas Company decided at a meeting of the City Council held recently to enter into contract with the Hydro-Electric Commission of New Brunswick for a supply of electricity. The amount required at present is 5,000,000 kw.-hr. half of which will be used by the Moncton Tramways, Electric & Gas Company for city purposes, the other half to go to the Canadian National Railways Company.

CONESTOGO, ONT.—The City Council has plans under consideration for the installation of an electric lighting system in Conestogo, to cost about $25,000.

LONDON, ONT. — The Public Utilities Commission is considering placing underground the electric wires in the downtown business section. The cost is estimated at $100,000.

MERLIN, ONT.—A by-law providing for the establishment of an electric light and power system in Merlin has been authorized by the ratepayers.

NIAGARA FALLS, ONT.—The Michigan Central Railway Company, Detroit, Mich. is considering the electrification of its lines in Canada between Niagara Falls, Ont., and Windsor, Ont.

PALMERSTON, ONT. — The bylaw authorizing extensions to the electric plant in Palmerston has been passed by the ratepayers.

WALKERTON, ONT.—Plans are under consideration by the City Council for the installation of an electric distribution system in Walkerton, to cost about $40,000.

MOOSE JAW, SASK.—A bylaw providing for extensions to the municipal electric light plant, to cost about $77,000, has been authorized by the ratepayers. D. Craven is city clerk.

## Miscellaneous

TAMPICO, MEXICO. — The Tampico Electric Light, Power & Traction Company has started work on double-tracking its lines on the principal streets and making important extensions into new territory. Among other improvements the company is reported to be considering the installation of new equipment.